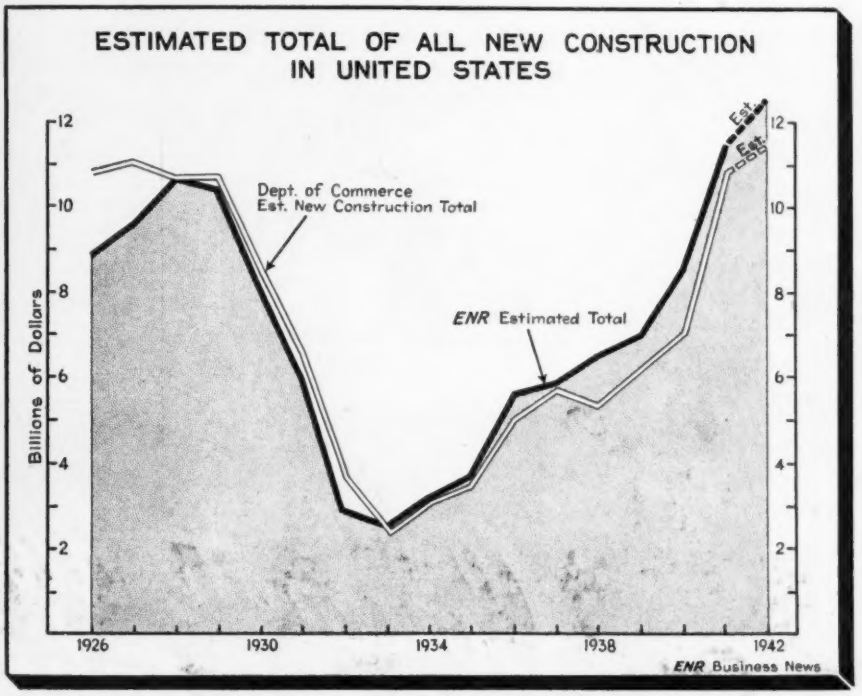
CONSTRUCTION TRENDS

Notes on significant movements in the construction industry



Construction Forecasts Indicate Record Year

THE CONSTRUCTION INDUSTRY is slated for its biggest year in history in 1942 despite the elimination of all non-essential work. Both *Engineering News-Record* estimates and those prepared by the Department of Commerce agree that new marks will be established but differ as to the amount expected to be expended.

ENR forecasts that $12.5 billions will be spent for construction in the continental United States during the year, with more than 80 percent of the volume financed with federal funds. This new estimate ups the one made at the beginning of the year by $2.5 billions, and is 10 percent above the 1941 total. It takes into account approximately $1 billion for army cantonment construction, added funds for buildings and utilities at military posts, and naval public works.

Off-the-continent bases and theater-of-operations construction are not included in this estimated volume, but they are expected to add another $3 to $3.5 billions to the predicted total. Much of the materials, equipment and some labor for these projects, of course, will be supplied from domestic sources.

The Department of Commerce estimates an $11.5 billion construction total for 1942, an increase of 6.5 percent over last year's estimated volume. Private construction makes up $2.9 billions, while public work accounts for $8.6 billions. The private total drops 45 percent from the $5.2 billions in 1941, but public is 54 percent above the $5.6 billions reported last year.

Domestic construction of cantonments, air fields, naval stations and other military facilities will come close to $4 billions in 1942, more than double last year's total, according to the Commerce Department. Expansion of industrial and commercial buildings to expedite war production is expected to attain $2.9 billions as compared with $2.6 billions in the preceding year.

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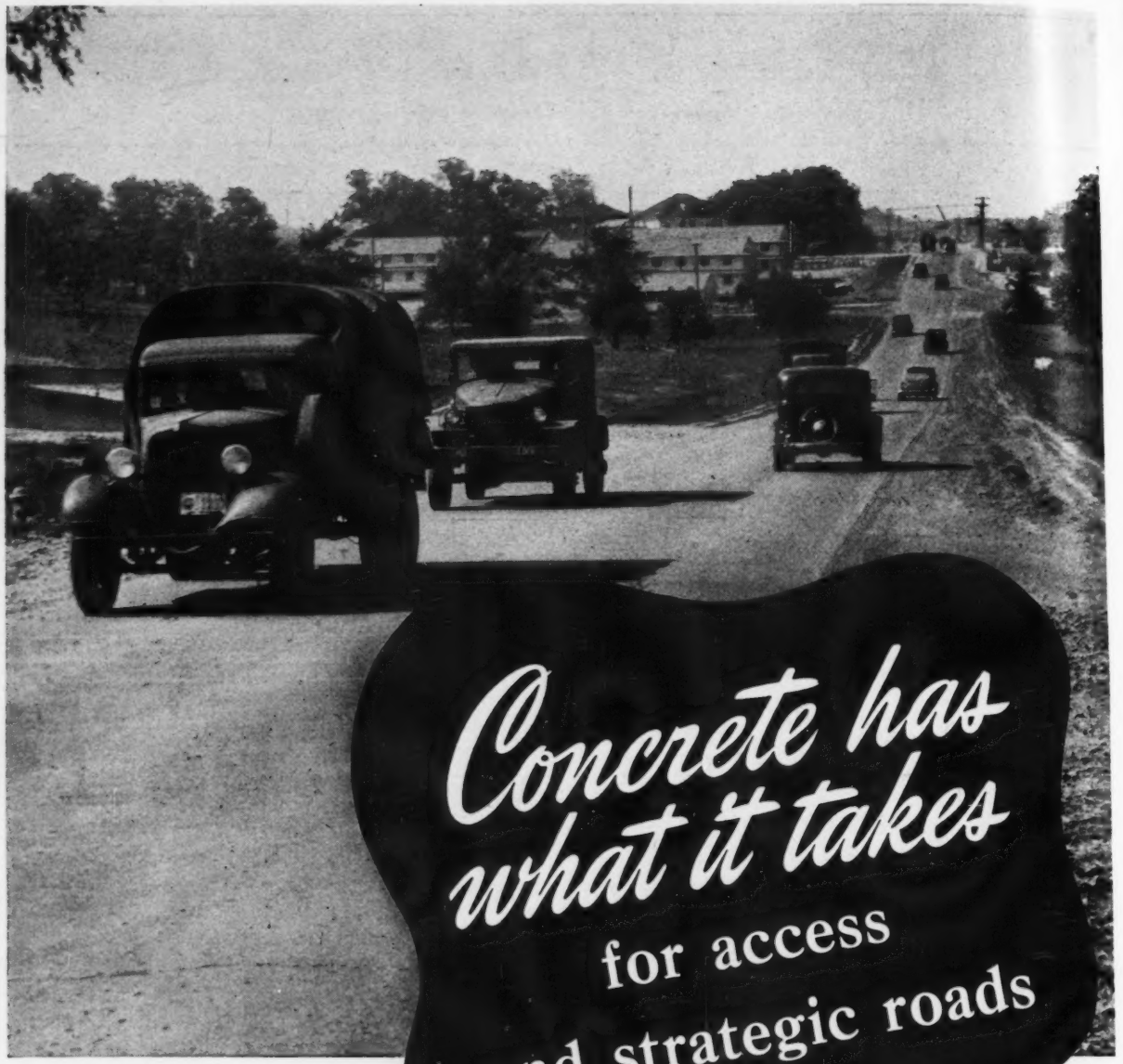
TABLE OF CONTENTS—See page 49



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Vol. 128 APRIL 23, 1942 No. 17

THIS WEEK

• Rapidly changing costs of labor, materials and equipment under wartime pressure lends special interest to the 1942 section on *Construction Costs* which forms part of this issue. Here will be found up-to-the-minute data on all phases of cost analyses relating to estimating, bidding, appraisals and valuation studies.

• One of the most tedious and time-consuming problems encountered by the engineer on water supply, subway or tunnel construction is that of calculating the areas and volumes at intersecting cylinders. In this issue is described an efficient, short-cut method, which includes formulas and tables that permit rapid calculations to be made.

• The shortage of structural steel in recent months has resulted in much "pioneering" in the field of timber construction. Some interesting and valuable innovations have been introduced, as for example, the use of 198 identical 36-ft. span double-web girders of plywood for a warehouse, all fabricated on the job site, as described in this issue.

• Two distinct types of water storage tanks are described in this issue. One has a 15-in. inner shell of prestressed concrete with an outer shell 4½ in. thick. The other tank is of steel construction in a unique design with exterior ribs that lend support to the ellipsoidal dome.

THINGS TO COME

• Efficient functioning of the nation's war effort requires that blackouts of street lighting be limited to the period when attack is imminent. Systems of street lighting control that will permit vital transportation arteries to be kept open for rapid movement of the armed forces and war materials, with the least occasion for accidents, will be outlined in the May 7 issue.

• Steel-frame doors that disappear below floor level when in the open position are being used on two airplane hangars in Texas to provide 20½ x 100-ft. end openings. Another innovation is the use of timber arch ribs for structural framing. Design and construction of these and other features will be included in the May 7 issue.

PAGE

The Week's Events 51

Reader Comment 58

Editorials 60

Plant for Bomber Assembly 62

Prestressed Concrete Water Tanks 64

Construction in Mexico A. N. CARTER 66

Exterior Ribs Feature Welded Tank 70

Welded Steel Fender Pier GEO. H. TINKER 72

Cylindrical Intersection Computations LOUIS J. SACK 74

Wire Rope Aids Shoring and Bracing 77

Warehouse Designed to Speed Construction 78

Plywood Girders Roof a Warehouse 81

Field and Office 83

New Aids to the Constructor 86

Manufacturers' Activities 94

New Publications 98

Meetings 105

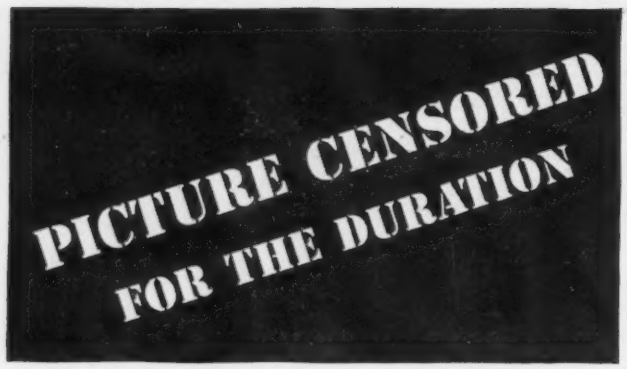
Men and Jobs 109

ANNUAL CONSTRUCTION COST BOOK 121

Construction Reports 267

Number of copies of this issue printed: 37,777

FOR ALL-OUT SPEED in Construction!



FOUNDATIONS FOR 4½-TON LATHES READY IN 19 HOURS

• Foundations for 4½-ton lathes making 300- to 400-lb. bomb casings were needed quickly. The contractor reported that placement of Atlas High-Early concrete was completed at 12:00 noon. At 7:00 the next morning, the lathes were in place on the foundations and working.

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Read what happened on the jobs illustrated here. On your next "Rush" contract, use Atlas High-Early and see what it will do for you. In actual application it is similar to normal portland cement and just as easy to handle. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, Kansas City, St. Louis, Des Moines, Birmingham, Waco.*

• The construction superintendent reported that Atlas High-Early, in addition to cutting time for completion approximately 50%, permitted earlier stripping of forms, saving 50% in form lumber costs.

SAVED 33% CONCRETING TIME

• In this 300-ft. x 600-ft. building, the contractor stated that Atlas High-Early cement cut concreting time 33% and saved 68% in rental cost of metal-pan forms.

• When munitions work called for a new 80-ft. x 300-ft. building, the company got it fast with Atlas High-Early cement. Twenty-four hours after concrete was placed the floor was in use.

ENR-H-48

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The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • APRIL 23, 1942 • VOLUME 128 • NUMBER 17

Record construction volume total seen during this year

WPB estimates volume for 1942 will reach about $15,000,000,000 although non-war work is cut to about one billion dollars as industry converts to war footing

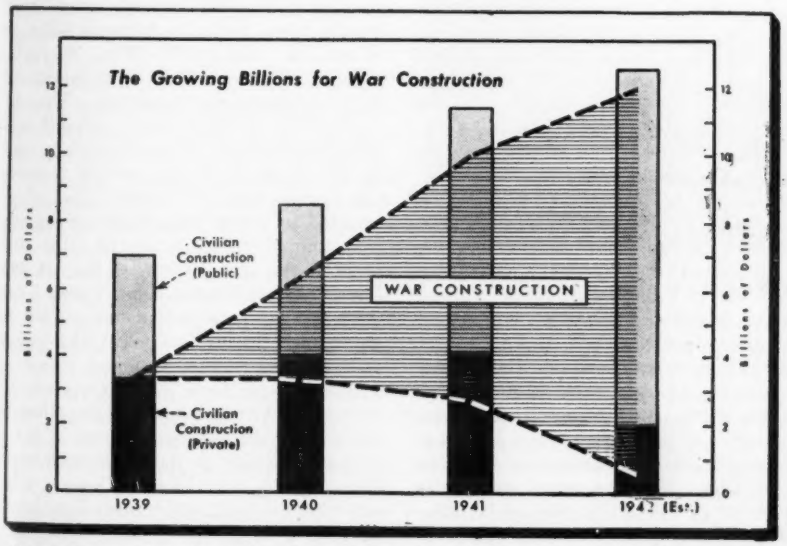
The construction industry, almost entirely converted to a war footing, is expected to attain a volume of about 15 billion dollars in 1942, the highest total in the nation's history, according to the War Production Board. Of this total, essential war construction will account for nearly 14 billions, including all necessary domestic work for the prosecution of the war and maintenance of civilian health and safety, all construction required for island bases, and certain work in connection with theater-of-operations activity.

Exclusive of the war work, it is forecast that about 1 billion dollars will be spent on construction classified as non-essential, an amount that is only about one-fourth of the total expended for such work in 1941. Based on an analysis of *Engineering News-Record* construction statistics for the first three months of 1942, this non-war work is almost equally divided between private and public.

Estimates of purely domestic construction prepared by *ENR* indicate a $12,500,000,000 expenditure in 1942, which is $2,500,000,000 above the estimate made at the beginning of the year and 10 percent above the 1941 total. About $11,500,000,000, or 92 per cent of the volume, is for war purposes, as shown in the accompanying chart. These estimated totals are based on the projection of opening quarter volumes as reported by *Engineering News-Record*.

Federally-financed construction is estimated at $9,500,000,000 for 1942 by *ENR*, and state and municipal work, the balance of the public estimate, is expected to be in the neighborhood of one billion. The federal total is 79 percent above 1941, but state and municipal work drops 47 percent.

Private construction is cut 52 percent from the estimated 1941 volume, with both engineering and residential building sharply reduced.



Domestic construction estimates prepared by ENR indicate a $12.5 billion expenditure in 1942 with over 90 percent for war work.

WPB continues tightening construction controls

Continuing to tighten the controls over construction, WPB last week placed heavy compressors under allocation, so that every delivery has to be specifically approved. Even the highest priority rating will not in itself get delivery of a compressor. A fairly mild control was also imposed on stocks of plumbing and heating equipment, limiting their use to essential repairs and approved rehabilitation and construction programs.

The compressor order applies to used and reconditioned as well as new equipment. It forbids the sale of any heavy compressor by any person without specific authorization from WPB. A heavy compressor is one with a displacement of 300 cu.ft. per min. or more unless it is of the crank and flywheel reciprocating horizontal type, in which case any compressor or dry vacuum pump with a 50 cu.ft. displacement is considered heavy.

A user who wants to buy a compressor must file form PD-415 with WPB. If the application is approved he will receive form PD-420 authorizing him to buy a compressor from a specific seller. If the named supplier is a manufacturer, he is required to accept and fill the order.

There will be a double check on the distribution of compressors from the suppliers' end. Every person having a stock of compressors on hand, or to be on hand by May 1, must report the details to WPB together with a list of orders on his books. He will then be directed which orders to fill.

The plumbing and heating equipment order, with minor exceptions, forbids sales over $5 except on priority ratings. Actually, nearly everyone who would be using such equipment has or can get a rating. New construction not eligible for ratings is forbidden anyway. Rehabilitation in defense areas is entitled to priority assistance. Under order P-84, plumbing equipment needed for maintenance and repair work is automatically entitled to a rating on a mere certification by the buyer that it is so needed. About the only job that is hit is rehabilitation outside defense areas.

These moves were seen as part of general preparations for placing of over-all priority ratings on construction equipment, as a means of heading off possible shortages in machinery on essential jobs.

State highway bureaus survey effect of stop-order on road construction

Much work halted pending clarification of status of road projects and obtaining materials for both maintenance and new work.

Highway bureaus throughout the United States spent last week surveying work in progress and work projected in the new light of the war production board's order that effectively stops all but definitely essential construction for the war effort (*ENR*, April 16, 1942).

James A. Anderson, Virginia State Highway Commissioner, submitted a preliminary report to Governor Darden which noted that allocations for primary construction made by the commission for the period through June 30, 1943, are being re-examined in order to sift out projects not essential to the war effort. Anderson's report said, however, that decreasing traffic, attributable to lack of tires and restrictions on gasoline, would lessen the need for highway modernization. He said that the department engineers would continue to plan future projects to form a reservoir for work after the war period is over.

In Oklahoma, the order brought a suggestion from S. H. Singleton, highway commission chairman, that completion of the federal government's $54,000,000 Denison Dam on the Red River be postponed to release steel for the state's military needs. Singleton said that some 20,000 tons of steel are planned for use in Denison Dam, and pointed out that about $5,000,000 in federal-aid money for highways allocated to Oklahoma cannot be used unless steel is made available. Status of several planned bridges over the Verdigris and Arkansas Rivers on U. S. Highway 69, between Wagoner and Muskogee, Okla., is uncertain due to the amount of steel necessary.

The Indiana State Highway Commission rescinded two bridge contracts which had been conditionally awarded, due to the restrictions on the use of steel. The bridges would have been built north of Salem, and north of Swazee. The department said that the structures will be redesigned for timber construction.

Approximately $50,000,000 worth of highway construction planned for this year in Pennsylvania has been stopped. T. C. Frame, chief engineer of the Highway Department, notified all district engineers to stop plans on work not physically started prior to April 9th. He said that projects under way which may be completed, amount to about half of the program planned for the year. The action was said to practically terminate construction for the coming season except for such projects where certification can be obtained from the military authorities.

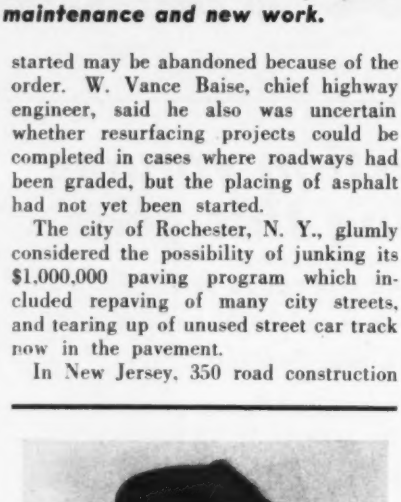
Several North Carolina highway projects already let to contractors but not started may be abandoned because of the order. W. Vance Baise, chief highway engineer, said he also was uncertain whether resurfacing projects could be completed in cases where roadways had been graded, but the placing of asphalt had not yet been started.

The city of Rochester, N. Y., glumly considered the possibility of junking its $1,000,000 paving program which included repaving of many city streets, and tearing up of unused street car track now in the pavement.

In New Jersey, 350 road construction projects scheduled for 1942 as a part of the county and municipal aid program may be affected. All county and municipal officials have been notified that they are not to proceed with new road building, whether or not the materials they plan to use are needed for the war effort.

All highway construction work in the State of Washington, was halted by direction of Burwell Bantz, state highway director. The highway department said it would confine its activities to keeping the state's roads in good condition during the war emergency.

Although much of the construction scheduled in Wisconsin for 1942 is said to be of a defense nature, William E. O'Brien, chairman of the state highway commission, said the ban might affect three highway projects, totalling more than 25 miles of road, which have been graded, but not paved.



Supervising engineer of Panama Canal transferred

Col. T. B. Larkin, supervising engineer of the Special Engineering Division, Panama Canal, has been relieved of duties at Balboa Heights, C.Z., and assigned to the Commanding General of the air forces at Washington, D. C.

Colonel Larkin has been a resident of the Canal Zone for three years, having served as commander of the 11th Engineers at Corozal, Colombia, assistant to the governor and supervising engineer of the Special Construction Division on the third locks project. When that division and the special construction were merged into the Special Engineering Division, he became supervisor of that organization.

Before reporting to the Canal Zone, Colonel Larkin for four years had been in charge of the construction of Fort Peck Dam, while he served as district engineer at Fort Peck, Montana. Other work in his long career with the Corps of Engineers has included flood control work on the Mississippi River.

• • •

WLB refers Wentzville dispute to labor members

The recurring jurisdictional dispute arising from activities of the CIO Construction Workers Organizing Committee in the AFL-dominated construction industry got briefly and informally into the hands of the War Labor Board last week. But the board quickly washed its hands of the problem, turning it over to the labor members of WLB to settle among themselves.

The whole question is a very touchy one because the Administration has been trying, in the interest of uninterrupted production, to keep the small CWOC out of the industry. But it hates to admit doing so, and CWOC keeps bringing the issue up.

The present dispute concerns a prefabricated housing project being built by the Farm Security Administration at Wentzville, Mo. (*ENR* Mar. 26, 1942, p. 461). The houses have been fabricated in a CIO-organized factory. The St. Louis AFL building trades council was unwilling to erect CIO-built houses, and an effort was made last month to erect the houses with CIO labor. The effort resulted in a riot, and FSA ordered the job shut down, later referring the dispute to the conciliation service of the Department of Labor. Conciliation, after some weeks, decided that the matter is outside its jurisdiction. FSA thereupon ordered construction resumed recently.

When the problem was put informally before the War Labor Board it followed its frequent practice of referring a jurisdictional dispute to the labor members. They agreed that Joseph Keenan, representing the AFL, and comptroller Gardner Wales of CWOC should thrash out the question with the St. Louis building trades council.

Survey and mapping group formalizes organization in Washington meeting

Second annual convention adopts formal constitution and complete organization of surveyor, mapper groups; Dodds made president.

Ten months after its start (*ENR* June 26, 1941, p. 981) the American Congress on Surveying and Mapping last week completed its organization and adopted a formal constitution.

At a two-day meeting, held in Washington, D. C. and attended by about one hundred members, J. S. Dodds, professor of civil engineering at Iowa State College, was elected the new president of the congress, succeeding Robert H. Randall. Maj. George H. Harding of the Corps of Engineers continues as secretary and treasurer.

Two new technical divisions—topographic and photogrammetric—were set up to supplement divisions already established. The topographic division is under chairmanship of John G. Staack, of the U. S. Geological Survey, and the photogrammetric group is headed by Virgil Kauffman of Aero Surveys, Philadelphia. John K. Wright and H. M. Dibert remain as chairmen of the cartography and surveying divisions, respectively.

Capt. C. L. Garner, of the U. S. Coast and Geodetic Survey, replaced Admiral L. O. Colbert as chairman of the control surveys division. Members of the established divisions took advantage of the meeting to plan future programs for the specific subdivisions and for a possible eight or ten additional divisions which may be formed at a later date if the need arises.

The group approved a decision to substitute a formal magazine devoted to technical articles for the present news bulletin distributed to the more than 500 persons included on the membership roster.

The meeting was primarily organizational rather than technical, but some lively technical discussions developed in the sessions of the cartography division.

Arousing particular interest was the presentation of a new system for projection of the earth's globe on a plane. It was developed by O. M. Miller of the American Geographical Society. Miller was asked by the State Department to work out a projection which would be superior in its representation of the polar regions to Mercator's familiar projection while avoiding the distortions associated with Gall's stereographic projection.

Miller's cylindrical projection retains the straight parallel lines of latitude and longitude and the equal spacing of longitude lines characteristic of the Mercator projection but uses a different formula for the spacing of the latitude lines. Another feature of Miller's work is the development of a graphical method of laying out great circles and concentric circles. It involves the use of a transverse projection (with the pole at the center and the equator at the edges) of the Miller grid onto a transparent sheet which is then superimposed on the map under development.

Dr. F. W. Boggs of the State Department discussed the importance of using a globe rather than a flat map in forming geographic conceptions and described the use of transparent hemispherical caps to be slipped over a globe and use for comparison of one area with another.

Dr. Richard Hartshorne, of the office of the Coordinator of Information, described a method of fitting a series of conal sections over the surface of a globe to make quick, day by day changes more simply than is possible by the usual method of fitting gores together. Leonard Wilson, also of the COI office described the facilities available in various map collections.

Decision yet to be made on Normandie salvage

Although workmen have been busy on the capsized liner Normandie, removing stacks and other portions of the superstructure that are above water, no final decision apparently has been made as to whether the vessel will be raised and restored to service, or scrapped. This is revealed by the appointment April 20 by Secretary of the Navy Knox of a special committee of marine engineers and other experts to look into the question.

The committee is headed by J. Barstow Small, of J. H. Winchester & Co., New York. Comdr. W. A. Sullivan of the Navy's Bureau of Ships, who has been in charge of the salvage work done so far by forces of Merritt-Chapman & Scott, Inc., is to serve as secretary of the committee. Other members include: W. A. Gibbs, of Gibbs & Cox, Inc., New York; Rear Admiral H. S. Howard, of the Navy's Bureau of Ships; H. G. Smith, president of the National Council of American Shipbuilders; A. V. Moore, president of the Moore-McCormack Lines, Inc., New York; Rear Admiral H. L. Vickery, United States Maritime Commission. There was no indication as to when the inspection would begin.

Water men trained for bombing emergencies

Preparing for prompt and safe restoration of water service in the event of bombing, the Division of Water in Newark, N. J., is training its maintenance crews in emergency main repair and sterilization procedures. The training program was put on a practical basis last week when a three-mile section of reconditioned 36-in. main was sterilized, using a mobile chlorinator recently purchased by the city.

Working under the direction of Fred Scherer, superintendent of construction and maintenance, and C. B. Tygert, engineer of the Wallace & Tiernan Co., Inc., suppliers of the chlorinator, key men of the Newark water division were instructed in the operation of the machine. The machine is mounted on a trailer and equipped with a vacuum chlorinator, a gasoline-operated pump, a residual chlorine comparator, and two 150-lb. cylinders of chlorine.

For the purposes of this test, a one-ton container of chlorine was used. Chlorine was added at the rate of 100 lb. per million gallons, the flow being at the rate of 3 mgd. A residual of 8-10 ppm. of chlorine was carried in the main.

Trained technical personnel shortage cited as most critical war bottleneck

National Society of Professional Engineers, meeting with New Jersey Group, considers questions raised by nation's growing war effort.

The most critical shortage in the nation's war effort at this time is not in materials, but in trained technical personnel on the production front, Harvey N. Davis, president of Stevens Institute of Technology, told a joint meeting of the National Society of Professional Engineers and the New Jersey Society of Professional Engineers last week.

The two groups held their session at Atlantic City, April 16 to 18. Preoccupation of members of the profession in war matters was evident in the small attendance. There were less than 100 members at any of the national society sessions, and these were chiefly official delegates from the twelve state societies represented.

Speaking on "Winning this War," Dr. Davis told the engineers that the New York metropolitan district alone could absorb all the engineering graduates of the nation's school this Spring. He said that selective service draft boards are not making any apparent effort to help the situation by granting deferments to technical men.

"Sentiment and public pressure makes it easier for young engineers to go into the armed services," he said, "rather than to remain in civilian occupations. However, most of these men could serve their country best on the production front."

Ernest J. Stocking, assistant chief, technical, of the examinations division, U. S. Civil Service Commission, detailed the difficulties that agency has in meeting the rapidly expanding needs of federal agencies for technically trained men. He said the weekly demand for engineers alone, to fill new positions and provide replacements for men called to active service, is about 2,000 men.

Questioned from the floor as to the use made of the roster of technical personnel compiled about two years ago with the aid of technical and professional societies, Mr. Stocking said that the roster is still being used, but is so out of date as to have almost outlived its usefulness. He asked engineers who have taken civil service examinations for higher class positions to state what minimum salary they would accept. "This permits offering these men lower grade positions if no vacancies exist in the higher levels," Mr. Stocking added.

Comment on the relation of engineers to world economic conditions from various angles was given by C. C. Knipmeyer, president, National Council of State Boards of Engineering Examiners; Professor Hale Sutherland, head of the department of civil engineering at Lehigh University, and Arthur V. Sheridan, planning commissioner, New York City.

Lack of salesmanship

Charles M. Upham, engineer-director of the American Road Builders Association, charged engineers with failure to properly sell themselves to governmental agencies. As a result, he said, engineering decisions are being made in Washington by men with no proper background qualifying them to make such decisions.

He cited as an example the provision in Conservation Order L-41, that officials of the Federal Housing Administration are to decide whether proposed highway jobs are essential to the war efforts (*ENR*, April 16, page 4).

In another part of his talk, Mr. Upham described the inter-American highway, using colored motion pictures to illustrate. He said that Mexico plans to spend one hundred and eighty million pesos on highway work this year, and that by the end of 1943, the highway should be open for traffic through to the Panama Canal.

Edward Larson, executive secretary, reported that the society had been successful in its opposition to the lowering of qualifications for inspectors required by the Coal Mining Inspection Act, and that while the committee had not succeeded in having written into the act a requirement that inspectors be licensed professional engineers, it had succeeded in having included a requirement that inspectors have five years of coal mining experience, and that they be men recognized by the Bureau of Mines as practicing mining engineers.

Chairman Samuel I. Sacks of the legislative committee reported that four more states had passed license laws during the year 1941. These were Delaware, Indiana, Massachusetts and Missouri, bringing the total with license laws to 45.

Society growth

Evidence of the continued growth of the national society was contained in the reports of E. A. Holbrook, president, Edward Larson, secretary, and Walter L. Simpson, treasurer. Active membership increased from 4,923 at the end of 1940, to 5,811 at the end of 1941. By April 1 of this year it has risen to 6,312. Arthur B. Sheridan, who is acting as editor of the American Engineer, reported on the new plans for that publication. He said that a publishing contract has been made with the National Industrial Publications Corp. of New York, and that company plans soon to launch a campaign to put the magazine on a self-supporting basis by the sale of advertising.

Among resolutions passed by the vari-

International Harvester photo

Scrap iron and steel to feed war hungry furnaces

Part of a total of 550 tons of scrap metal collected in a recent drive sponsored by a machinery and equipment company as an aid to the war effort is shown at Great Bend, Kan. Most of this metal was in the form of unused or discarded farm machine equipment. Contributors were advanced $7 per ton for the scrap turned in, pending final sale to processors.

Many contractors and machinery manufacturers in the construction field have also started investigation of the piles of scrap and unused machinery in their own yards.

ous groups was one by the New Jersey Society which went on record in favor of amending the state license law to permit engineering graduates to take their written examinations upon graduation instead of waiting until they have obtained the practical experience needed for a license.

New officers of the New Jersey group are Russell S. Wise, Passaic, president; C. George Krueger and Philip Kissam, vice-presidents. Frederick D. Braun was reelected secretary-treasurer.

• • •

Second WPB war material scarcity list issued

Containing a listing of non-metallic materials available for essential construction, the second of a series of provisional reports on the relative scarcity of materials used in the war effort has been issued by the Bureau of Industrial Conservation of the War Production Board.

As was the first list (ENR, March 19, 1942, p. 447), the compilation generally is divided into three groups which list materials in the order of their importance.

Under conservation order L-41 issued last week, Harvey A. Anderson, chief of the bureau, said that the list of materials available for construction was made to assist engineers in the conservation of metals.

Among items listed as not restricted by existing orders are: foundation materials of wood, concrete, concrete block, brick, tile, cement, lime; for beams, timber; for walls, wood, brick, concrete, tile; windows, wood frames and sash, glass blocks; outside finish, brick or stone, stucco; sidings, wood or cement asbestos shingles; paints; roofing, timber, wood sheathing, slate, tile, tar and gravel on bituminous felt; gutters and pipes, wood, treated and painted steel; tubs, vitrified earthenware, built-up tile.

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Ontario will put power curb in effect this fall

Definite restriction on the use of electrical power will be put into effect in Ontario, Canada, by the first of October, according to W. L. Houck, a member of the Hydro Electric Power Commission of Ontario.

Restrictions would be placed on street lighting and window display and advertising sign lighting. In an announcement to the Province's legislature, Mr. Houck said there will not be complete restriction of window lighting, but a reduction in the amount of power available for this purpose. In line with this program, the commission will institute an educational program on power conservation.

Associated Press Photo

Naval pier goes up in record time

Some of the workers who pushed through construction of a 700-ft. naval service pier in 43 working days, two days ahead of schedule, take time out for lunch. During construction, 150 workmen drove 42,700 ft. of creosoted piling, framed 200,000 board feet of creosoted timber and poured 22,700 ft. of concrete deck.

TVA and Kentucky cities buy utility properties

The Tennessee Valley Authority made its first major entry into Kentucky last week when, in joint dealings with five Kentucky cities and three rural electrical cooperatives, it purchased properties of the Kentucky-Tennessee Light & Power Co. in southern and western Kentucky for a total of $3,535,000.

Announcement of the agreement was made after the Bowling Green city council voted unanimously to enter the contract with TVA. The total agreed outlay for purchase of the distribution properties in five cities—Bowling Green, Russellville, Hopkinsville, Murray and Mayfield—is $2,077,900. The cooperatives agreed to purchase other distribution facilities for $514,600 and TVA agreed to purchase the utility's generating plant for the section covered at a price of $942,500. The deal was consummated under a 1942 legislative act permitting Kentucky cities to acquire their own distribution systems and contract for TVA for wholesale current.

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Waterworks men will air war effects on utilities

Effect of air attack upon utility structures and the operation of a mutual aid system will be featured at the conference on war time waterworks problems sponsored by The American Water Works Association at Chicago, June 21-25.

A tentative program, announced by Harry Jordan, association secretary, includes a number of papers dealing with both the administrative and technical phases of maintaining water service under difficult conditions.

Of special interest to designing engineers is a paper on the conservation of critical materials in the construction of Chicago's South District Filtration plant.

Equipment manufacturers in the waterworks field are planning exhibits which place stress on maintenance and service activities.

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Property owner not damaged by road detour

The North Carolina Supreme Court last week dismissed a suit in which a property owner sought damages from the city of Springfield because the city closed a grade crossing after constructing a new underpass.

The decision said in part:

"Those who take up residence or purchase and occupy property in proximity to public roads or streets do so with notice that they may be changed as demanded by public interest. To justify recovery in such cases, the damage must be direct, substantial and proximate, and not such as are attributable to mere inconvenience."

Reclamation bureau plans to start on Davis Dam work despite low priority

Agency believes it can get Dam well under way before priority trouble arises. Unusual provisions made in bid specifications to protect contractors.

If the Bureau of Reclamation is able to get satisfactory bids May 15 on its $40,000,000 Davis dam project (*ENR*, April 16, p. 12), it proposes to start work, despite the fact that its present priority rating, A-2, is recognized to be inadequate to get materials that will be needed. It is doing this in the belief that it can get the project—an earth and rockfill dam—pretty well along before trouble arises on materials. By that time, if a power shortage has developed in the area, near Kingman, Ariz., higher priority ratings can be sought. If not, the job can be stopped until the war is over.

Several unusual clauses have been included in the specifications to protect the contractor against these hazards. There is no penalty clause for delay in completion of the work. Provision is made for immediate payment for preliminary work by the contractor of a sort which is not ordinarily included in payment estimates—such work as building a construction camp, access roads, fixed plant, and the like. Payments so made will be later deducted from vouchers covering actual dam construction.

The Government agrees to absorb 60 percent of the extra costs arising from any increases in wage rates during the life of the contract.

In case the job is stopped or temporarily postponed, provision is made for negotiation of liquidated damages to be paid to the contractors.

Bids for the generators and turbines for Davis Dam will be opened May 25 and 26. Although delivery dates are specified in the specifications, no penalty is attached to late delivery. An escalator clause is included by which the contract price will fluctuate with changes in the Bureau of Labor statistics index of wage rates.

The Reclamation bureau now has several jobs going ahead despite low priorities. Keswick Dam, of the Central Valley project in California and Bullshead Dam, on the Colorado River, have an A-2, Anderson Ranch, in Idaho, and Green Mountain have A-3. The other sections of the Colorado-Big Thompson project, of which Green Mountain is a part, have only an A-10 rating.

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ODT refuses certification of Texas-Georgia pipeline

Joseph B. Eastman, director of Defense Transportation, last week refused a request that he certify as necessary to national defense a 1,050-mile crude oil pipeline between Wichita County, Tex., and Savannah, Ga. The Trans-America Pipe Line Corp. had applied for the certification.

In rejecting the application, Mr. Eastman said that steel requirements were set at 85,000 tons, and there was no showing that needed pipe, pumps and other materials are available under present conditions. He said also that the War Department actively opposed the application on the grounds that the line, because of its location, would be of little value to the war program.

• • •

Discuss plan to maintain war builders' machines

Manufacturers and distributors of construction equipment are now conferring with Army and Navy officials on a scheme by which distributors facilities would be used to keep the equipment of war contractors in top-notch condition.

Under the proposed scheme, a distributor for a particular make of equipment would inspect all equipment of that make owned by the Army or Navy contractors in his area periodically. He would recommend any needed repairs and estimate future replacement parts requirements. This scheme could have the double purpose of keeping equipment in shape and of making it unnecessary for contractors to acquire huge stocks of replacement parts for all contingencies. The plan, which has not yet obtained official acceptance, has been tried out in a small way by Caterpillar Tractor Co. distributors especially in the southeast.

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Call bond election

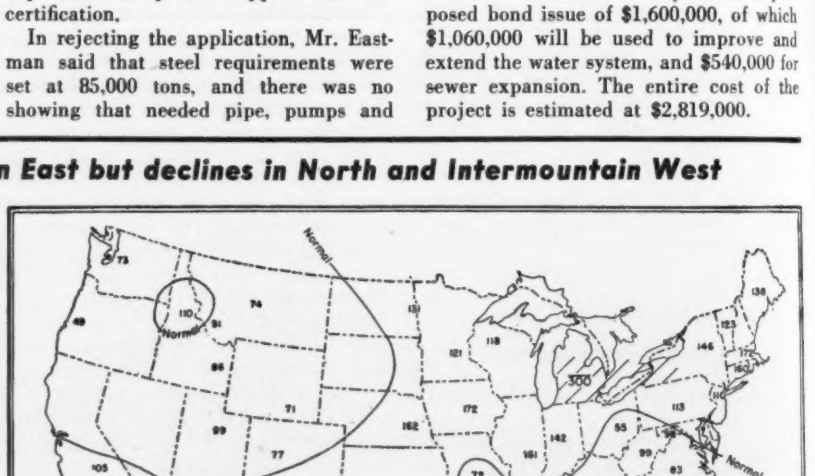
The Mobile, Ala., City Commission has called an election for May 14 on a proposed bond issue of $1,600,000, of which $1,060,000 will be used to improve and extend the water system, and $540,000 for sewer expansion. The entire cost of the project is estimated at $2,819,000.

Stream flow goes up in East but declines in North and Intermountain West

A marked increase in stream flow in the East, and general decrease in the northwest and in the northern intermountain region were noteworthy during March, although in general, there were no areas where stream flow was seriously deficient. In the west, carry-over storage of last year, together with water stored the past winter is enough to assure satisfactory water supplies for present needs.

For the country as a whole, the total surface-water supplies now available, as represented by the combined flow of eastern rivers, the water stored in reservoirs and the snow cover in the West, are greater than last year and represent a favorable contrast to conditions of March a year ago, especially in the East.

During March, floods were reported in western New York, southern Michigan and in states of the southeast sector of the country.



OBITUARY

Roy Wildes, 45, of West Palm Beach, Fla., a construction engineer employed on defense work in Porto Rico, died recently at Porto Rico.

Dr. Charles Francis Harding, 60, head of the Purdue University electrical engineering school and an authority on high voltage power transmission, died April 13 in his office at the school. He had been dean of the school since 1908 and had written several books, among them Business Administration for Engineers.

Frank J. Coll, 54, president and one of the founders of the Richmond Engineering Co., of Philadelphia, Pa., died April 16 at Philadelphia.

C. J. Head, 78, British engineer and metallurgist, died recently at Montreal. He had been a resident of that city since 1928.

Roy Lee Wayson, 26, of St. Albans, W. Va., an apprentice engineer on a construction job at Cabin Creek, died recently of injuries sustained in a fire at his home.

James L. Burley, 69, senior partner in the New York architectural firm of Theodore Visscher & James Burley, which designed all new buildings constructed at Lehigh University in the last 25 years, died April 19 at East Norwalk, Conn.

L. McQuilkin, assistant district engineer for the Public Buildings Administration in Dallas, Texas, died recently at Bridgewaters, Long Island.

John C. Sherman, 73, consulting engineer, died recently at Attleboro, Mass.

Charles B. Dannenberg, 60, structural engineer and assistant building inspector of Wilmington, Del., died April 16. A native of Wilmington, Mr. Dannenberg had been an employee of the New Castle County engineer's office before accepting the post of assistant building inspector. He assisted in laying out the Philadelphia airport and the airport at Camden.

Joseph McLaughlin, former superintendent of erection for the Dominion Bridge Co., died at Lachine, Que., recently. He was 81.

Edward Flannery, 63, for 35 years superintendent of the Chanute, Kan., municipal gas and water departments, died at his home recently.

William E. Linthicum, 73, founder of W. E. Linthicum & Son, High Point, N. C., excavating contractors, died at High Point April 10.

John Mamon, Sr., 54, general building contractor of Niagara Falls, N. Y., died April 11.

Alfred H. McKeel, 74, building contractor of Campbellford, Ont., Canada, died there recently.

Sam C. Beal, highway contractor of Bear Creek, N. C., died recently.

John Noll, 67, contractor at Apopka, Fla., for several years and a native of Chattanooga, Tenn., died at St. Petersburg, Fla., April 16.

B.C. hospital building program tops $2,000,000

Hospital construction completed in British Columbia during the past year, or now under way is well in excess of $2,000,000, a survey showed last week. Total cost of hospitals for which the value of contracts has been made public, is $1,895,943, and is in addition to a large number of other hospitals erected for the Army, Navy and Air force on which no cost figures have been released.

Largest single unit is the new Shaughnessy Military Hospital at Vancouver, built at a cost of $720,000, and next largest is a $550,000 addition now being started for Vancouver General Hospital.

CONTRACTS AND CAPITAL

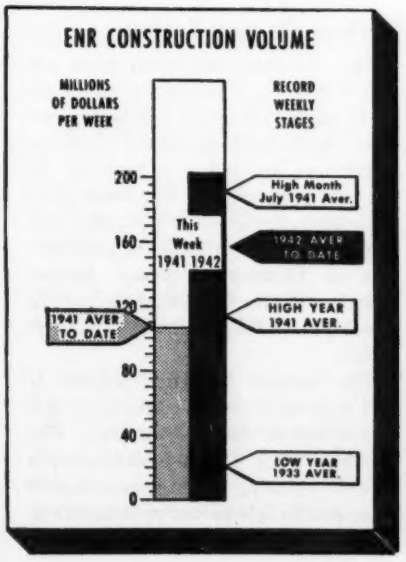
ENGINEERED CONSTRUCTION for the week totals $214,369,000, just double the volume reported for the corresponding 1941 week, and 44 percent above the total of a week ago. Public construction is responsible for the gain over last year, climbing 207 percent, while private work declined 63 percent. Comparisons with a week ago reveal a 47 percent gain in public, and a 14 percent rise in private work. Federal construction is 391 percent higher than in the 1941 week, and is 46 percent above the preceding week.

The current week's volume brings 1942 construction to $2,709,514,000, an increase of 47 percent over the total for the 17-week period last year. Private work, $243,132,000, is 52½ percent under a year ago, but public construction is 85 percent higher as a result of the 148 percent gain in federal work.

In the classified construction groups, gains over last week are in industrial, commercial and public buildings, earthwork and drainage, streets and roads, and unclassified construction. Gains over the 1941 week totals are in public buildings, earthwork and drainage, and unclassified construction.

New capital for construction purposes for the week totals $10,436,000. This compares with $762,346,000 for the corresponding week a year ago. The current week's new financing is made up of $2,133,000 in state and municipal bond sales, $254,000 in corporate security issues, $49,000 in RFC loans for public improvements, and $8,000,000 in RFC loans for industrial expansion.

New construction financing for the year to date, $2,445,625,000, is 20 percent below the volume reported for the 17-week period in 1941.



CONTRACTS

(Thousands of dollars)

	Week Ending Apr. 24 1941	Apr. 16 1942	Apr. 23 1942
Federal	$37,820	$127,172	$185,730
State & Municipal	27,033	7,631	12,981
Total public	$64,853	$134,803	$198,711
Total private	42,237	13,774	15,658
TOTALS	$107,090	$148,577	$214,369
Cumulative 1942	(17 weeks)		$2,709,514
1941	(17 weeks)		$1,842,811

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1941 17 weeks	1942 17 weeks
NON-FEDERAL	$328,947	$220,670
Corp. Securities	105,712	71,414
State & Mun.	183,544	117,893
U.S.H.A. loans	13,521	.....
R.F.C. loans	26,170	31,363
FEDERAL	$2,718,837	$2,224,955
TOTAL CAPITAL	$3,047,784	$2,445,625

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	Apr. '42	271.78	130.64
Building Cost	Apr. '42	219.55	118.68
Volume	Mar. '42	578	253

FHA MORTGAGES

	Week Ending Apr. 19 1941	Apr. 11 1942	Apr. 18 1942
Selected for appraisal			
Title II	$34,820	$18,916	$20,794*
Title VI	$ 6,340	$17,504	$10,315*

* Subject to revision.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Refinement in Design to Conserve Materials

Sir: Europe, as compared with America, has for a long time had a relative shortage of materials and relative abundance of highly trained technical men. This combination resulted frequently in more refined methods of design than ours in order to economize on material; witness the extremely slender reinforced-concrete arches of the French. We now face a shortage of material, without yet, however, having an abundance of highly trained technical men. Nevertheless, we should consider more carefully than ever the possibilities for economy of material through refinement of design. Instead of "beefing up" a design "to make sure" (often in the past a more economical procedure than to go into an intricate analysis), it may now pay us to study theory (and tests) more carefully, with a view to eliminating unnecessary material. For example, work on steel rigid frames in recent years seems to indicate that radial stiffening of the knee can be much reduced, if not even eliminated in many cases.

Increased testing is necessary, but not enough. To be effective, tests must be planned to permit drawing as general conclusions as possible, and this usually means that preliminary tests must be made on sufficiently idealized structures or structural elements to permit a theoretical or at least a rational analysis. The actual structure will usually present so many variables that a theoretical analysis based on tests of such a structure alone will be impossible; but if most of these variables can be eliminated in the preliminary tests, it may be possible to obtain a preliminary theoretical analysis as a basis for design. This analysis can be modified as the variables in the actual structure are introduced.

The purpose of the test investigation should be to permit the widest possible generalization. Just as theory without confirmatory experimental evidence is of doubtful value, so tests that permit no general conclusion to be drawn are of limited value. Doubling or tripling a testing program by adding carefully planned and thought out tests may increase the value of the program ten or even a hundredfold.

We are better situated in this country as regards testing than as regards theoretical analysis, for we have not needed the talent for the latter so much. The two abilities involved, however, are equally necessary, one complementing the other. It would be well to accelerate the increasing interest in theoretical analysis of engineering problems in the graduate courses of our engineering schools. The government is doing a splendid thing in subsidizing some of these courses. Undoubtedly industry is helping by granting leaves of absence with or without pay to promising young members of its technical staffs for the purpose of attending the courses. Could not this cooperation be increased?

In summary, then, more effective use of existing material is needed, and one way of bringing this about is by increased application of theoretical analysis to engineering problems.

WILLIAM R. OSGOOD
Materials Engineer
National Bureau of Standards
Washington, D. C.

Defense Or Non-Defense

Sir: At this time when there are real scarcities of all materials, especially steel and other building materials, large and luxurious building operations are being permitted. In this connection the Equitable Life Assurance Society has procured priority #77-012-6-303 for the construction of 14-story, fireproof, garden apartments for 1,200 families in Brooklyn (*ENR*, Feb. 5, 1942, p. 213).

The excuse for this project is that it is in a defense area and that it will house defense workers. The Brooklyn Real Estate Board, after a careful survey, found over 50,000 vacancies in low-priced apartments in the borough. They also found thousands of houses that were boarded up and which could be easily rehabilitated. In the immediate vicinity of this new project are hundreds of sound dwellings which can be renovated with non-critical materials and which would make perfectly good housing at low cost for defense workers.

It is estimated that this new project will use over 500 carloads of critical materials. It has been brought to my notice that the Citizens' Housing Council waxed wroth over the granting of this priority and demanded that Fort Greene Housing, a low-priced apartment project on a very extensive scale, be restarted. This had been one-half stopped because of the urgent need of materials.

No one denies the need of housing for defense workers. There is no need, however, at this time for luxury accommodation, and the large financial organizations should think first of the United States and its survival rather than their own immediate interests.

JACOB MARK
Consulting Engineer
Brooklyn, N. Y.

Higher Unit Stresses For Structural Steel

Sir: The writer has read with interest the letters relating to increased structural steel unit working stresses (*ENR*, Feb. 12 and March 26, 1942). These discussions are timely and vital from the standpoints of safety and economy in this crisis through which we are passing. The designing engineer who has followed the trend of improvements in basic materials as well as in recent design likes to believe that part of the economy in design may be accomplished by the use of increased working stresses in materials without sacrificing the safety of structure.

It is well known that in the past 20 years structural steel has been improved so that specifications list ultimate strength as 60,000-72,000 instead of 55,000-65,000 psi., and that unit stresses have increased from 16,000 to 20,000 psi.

The writer has observed recent mill analysis reports of steel for bridges, furnished under A.S.T.M. specifications primarily. Yield point stresses for both plates and shapes varied from a minimum of 36,000 psi. to slightly beyond 50,000 psi.,

with a considerable number of tests in excess of 40,000 psi. The ultimate strength values varied from a minimum of 60,000 psi. to 74,000 psi. The chemical analysis exhibited no unusual characteristics except for one item, and that was a manganese content ranging from 0.004 to 0.006+.

It is well known that some of the high tensile steels contain little, if any, more manganese than the above designated percentages. It is also known that the manganese improves the ductility of steel. Consequently we observe an odd condition in what is termed medium open hearth steel. The yield point may run as high as 50,000 psi. and yet the ultimate strength remains about 65,000 psi., properties approaching that of a low-alloy, high-tensile steel. Obviously, then, there has been an attempt by the rolling mills to produce a steel for ordinary construction purposes superior to that anticipated by the designing fraternity.

Knowledge of stress analysis has been greatly enhanced both from the standpoint of mathematics and mechanical means. We are more cognizant of the loading conditions involved, and we are becoming particularly zealous on the fine points of design, which is as it should be. So, in view of the advancement in the physical properties of steel as well as the advanced knowledge of design, it seems to the writer that an increase in working stress from 18,000 to 20,000 psi. for bridges, and to 22,000 psi. for buildings, is not out of line. This will effect an economy of approximately 10 percent. We might even go farther than the figures mentioned, and with safety, too, but the writer would be satisfied with the general adoption of the above basic stresses.

H. S. ROCKOFF
Designing Bridge Engineer
Columbus, Ohio

Pile-Driving Formulas

Sir: With reference to my article, "A More Dependable Pile-driving Formula," in *ENR*, Dec. 18, 1941, p. 892, in which the new "B-41" formula was described and compared with others, I have continued the study and have developed a later edition, named "B-42," which is compared with the "B-41" description as follows:

For gravity hammers, the coefficient is increased from 2 to 2.5. For single-acting hammers the formula is the same as the B-41. For double-acting the coefficient is increased from 2.5 to 3. A limiting range for the "B" factor (previously set for the B-41 as from 0.5 to 1.5) has been omitted. All other terms, including determination of the "B" factor, remain the same.

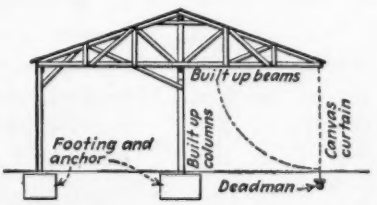
A compilation entitled "Pile Capacity Study," showing details of 52 Ohio tests, elaborating further on this statistical research, and describing the "B-42" formula and its use, has been prepared. Prints have been sent to a number of engineers who we know are interested. Others who wish to review this study may have prints on request, as long as our limited supply lasts.

W. H. RABE
Chief Designing Engineer of Bridges
Ohio Department of Highways
Columbus, Ohio

Cantilever Timber Hangar

Sir: There has been much comment about the necessity for fast construction of war projects, the need for saving critical materials and the desirability of using readily available materials for construction of such work. During World War No. 1 the same conditions prevailed and, while employed by the Bureau of Yards and Docks, U. S. Navy Department, I was asked to design a hangar to house bombers with a wing spread up to 112 ft. No steel was available for immediate construction, but we could get lumber 2 in. thick of various widths and lengths.

The accompanying sketch shows the scheme used for the hangar. It is



Timber hangar with cantilever roof built during the last war.

a cantilever design with the entire front open, free from columns. There was a line of columns along the middle of the hangar, and it was intended that the tails of the planes could go between these columns which were perhaps 25 ft. apart.

This hangar was built 600 ft. long. The roof rafters were trussed, as shown on the sketch, and the columns and beams were built up of 2-in. material. The columns and back walls were tied down to resist uplift. In lieu of doors, the front was closed in bad weather by canvas which was secured at the bottom by snap hooks fastened to rings which in turn were anchored to a "deadman."

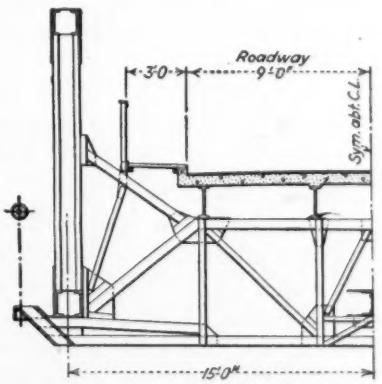
To check this design before the hangar was built, a bent of two trussed rafters was built on the ground, set up on low supports and then loaded to failure. It broke apart at the joints under a load very close to that calculated.

The hangar was built rapidly and gave satisfactory service.

FRANK M. WEAKLEY
Construction Engineer
Public Buildings Administration
Federal Works Agency
Washington, D. C.

Suspension Bridges Under Wind

Sir: I regret that owing to preoccupation with war work I cannot take part in the correspondence regarding suspension bridges, but I think your readers may be interested to see the cross-section of the Otto Beit Bridge across the Zambesi, Rhodesia, built in 1938–1939. The



Half cross-section of Zambesi River bridge in Africa, a light suspension structure.

bridge is a light roadway bridge of 1,050-ft. span. (The element of interest to which Mr. Freeman apparently refers is the open construction between the footway and the stiffening truss, which provides a wind vent.—*Editor.*)

RALPH FREEMAN
Freeman, Fox & Partners
Consulting Engineers
London, England

EDITORIALS

VOLUME 128 NUMBER 17

April 23, 1942

Enough Construction Equipment?

As CONVERSION of industries from their normal products to implements of war daily grows more extensive, it is natural that questions should arise regarding the role of the construction equipment manufacturers. It is not to be supposed that the potentialities of these companies for the making of war goods has been overlooked when washing machine, typewriter and spark plug manufacturers have been drafted. Indeed, inquiry in Washington will reveal that the construction equipment situation is under close scrutiny. And it will also reveal that the reason the majority of construction equipment manufacturers are not already making machine guns, tanks and other such things is that their normal products have been regarded as essential to the war effort. We can give up washing machines, but we still need pavers, tractors and power shovels to create facilities to wage the war successfully.

The basic question, therefore, is not "Why hasn't the construction equipment industry been converted?" but "Should we convert it, and if so, how and when?"

IF SUCH A QUESTION is to be answered satisfactorily, a large number of facts need to be evaluated. Some of these facts are now known, as, for example, that, unlike the washing machine industry, which made a single product, the construction equipment industry makes scores of different products; that some of these products have a more essential war use than others; and that even companies making essential construction machines often have excess capacity, in the form of additional shifts, that could be utilized for war equipment fabrication. It is also known that if warfare on a global scale means construction on the same scale, only the United States has an industry that can supply the necessary equipment. Finally, it may be conceded as known that the construction equipment industry is ready and willing to convert to other war purposes the great slice of the nation's metal working capacity and brains that it represents whenever the high command decides that there is sufficient construction equipment on hand.

Facts that are not known include the amount and location of idle equipment that could safely be transferred to war jobs, and the size of the war construction task that still lies ahead.

IN CONSIDERING THE PROBLEM of how and when to convert the construction equipment industry, one thing seems clear: The War Production Board must know the expansion plans of the Army, Navy and Maritime Commission with a high degree of certainty. To show why this is so, it seemed possible less than two months ago to measure future construction equipment requirements rather accurately. But early this month, when the sixth supplemental appropriation bill passed the House, it contained the largest construction item in any single bill since the war began, five billion dollars. If the Army has any more such surprises up its sleeve, WPB planners will need to know them unless a dangerously wrong decision is to be made.

Assuming, however, that the war's requirements of construction equipment can be made known, the question then becomes one of first finding how much equipment is in existence; second, locating that which is idle or being used for non-essential work; and third, diverting this idle or non-essential equipment to war jobs. An inventory, such as these moves suggest, would seem to be a necessary prelude to any evaluation of the construction equipment situation. But it would have to be taken and analyzed in the briefest possible time so that it would mirror current conditions, and this would entail fullest cooperation from everyone owning and operating construction machinery.

The recent WPB order forbidding any new unauthorized construction should be effective in increasing the amount of equipment available for war construction jobs. And if, as is expected, non-essential construction jobs that are already under way are to be stopped, another batch of equipment will become available. These developments, plus the recent orders placing purchase of trucks, crawler tractors, shovels and cranes under rigid control, tend to bring our resources of construction equipment more directly and more completely into the war effort. But they increase rather than diminish the need for an inventory.

ONCE THE INVENTORY IS MADE, the task of diverting idle or non-essential equipment to war jobs must be faced. The plan to place a price ceiling on used equipment would be a constructive step in this direction. Then there is the problem of equipment in the hands of public agencies. Except for cities that are potential enemy bomb targets and thus may need

for repair of essential services even more construction equipment than they have, public agencies may on analysis prove to be an important source of equipment for war jobs. How much maintenance equipment, for example, is needed by states and counties for necessary road work? How much construction equipment is owned by contractors not doing or likely to do essential war construction? How much construction equipment is owned by the Army and Navy that is not needed for essential maintenance and force-account construction work? And what about the equipment owned by quasi-governmental bodies, federal and state, who do their own construction work and who may find their operations curtailed by war?

WHEN ALL OF THESE FACTS are at hand and evaluated, it may well be decided that a large part of the construction equipment industry must remain on its present job indefinitely. Or the facts may demonstrate the desirability of converting some companies and not others, or even to have companies expand their operations to include war goods while continuing to turn out their normal construction equipment.

The problem is one of the most important and difficult that faces the WPB in its program of bringing our full weight into the war. Judged by its recent moves to force all existing equipment onto essential jobs, and by the thoughtful planning that preceded these developments, the WPB is proceeding on a course that offers much encouragement. Recognition is being given to the fact that it would be disastrous to stop making construction equipment before we have enough on hand. And there is equal appreciation of the fact that it would be a serious waste of manufacturing capacity and manpower to make more construction equipment than is actually needed. Contractors and construction machinery men are, one can be sure, equally realistic and patriotic.

Earth Tilting

A LITTLE KNOWN PHENOMENON in the field of earth movements, namely tilting of the surface, has been observed recently in Long Beach, Calif., and made the subject of careful measurements. Speculations as to its cause serve to emphasize how little we yet know about movements of the earth's crust or their meaning. If, as seems generally supposed, the tilting is a tectonic movement, rather than a subsidence related to water table changes, it may be a manifestation of the forces that build up compressive stress in earth strata to a point where slippage occurs, the resulting movement of which is called an earthquake. If so, it is akin to other movements, not accompanied by tilting, that have been observed along the west side of the San Andreas fault in this same region. Complete understanding of movements in the earth's crust still escapes us. But useful records are gradually being built up, to which the Long Beach tilting data (*ENR*, March 26, 1942, p. 477) form an important addition.

No More Non-War Construction

THE WPB ORDER forbidding the start of any new non-war construction jobs is more important for what it signifies than for what it does. Its immediate effect is merely to plug some leaks in the priority system through which materials were flowing away from instead of into war construction. It will stop small builders from using materials that they could "locate" without priority, and it will cause a considerable reduction in roadbuilding through a much stricter interpretation of what projects are essential to war. Dislocations in employment from these reductions can, however, only be temporary, for war construction already scheduled for this year adds up to more than the industry has ever turned out in twelve months. Indeed, if the schedule is to be met, the contract lettings in the last six months of this year must rise to the unprecedented *rate* of 18 billion dollars annually. Realization of this fact was one of the important causes for the order, and from this realization arises its signficance. For to handle such a program, all existing construction materials, manpower and equipment must be marshalled, which suggests that other orders are to follow. One of these might stop non-essential construction already underway, another might place price ceilings on equipment rentals and purchases, a third might requisition equipment and materials from public agencies whose construction work is deemed non-essential. For more than a year the construction industry has been on about an 85 percent war footing. The significance of the WPB's recent stop-order is that it is the first step toward raising this quickly to 100 percent.

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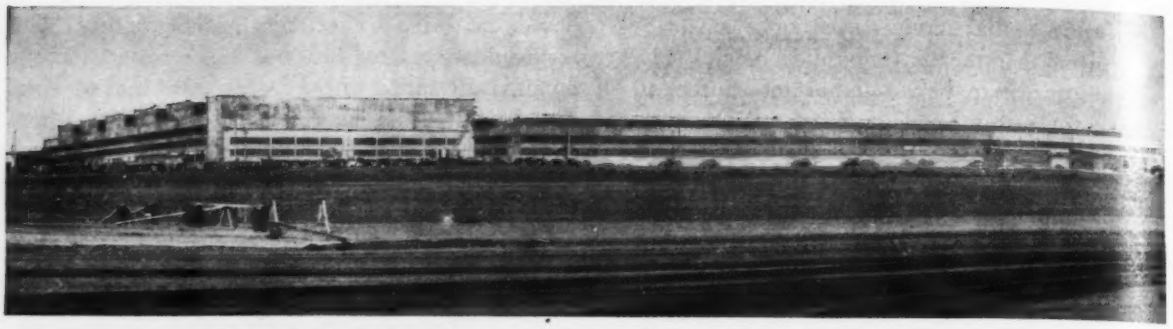


Completed plant is a huge gray structure with a maximum of window area.

Inland Plant for Bomber Assembly

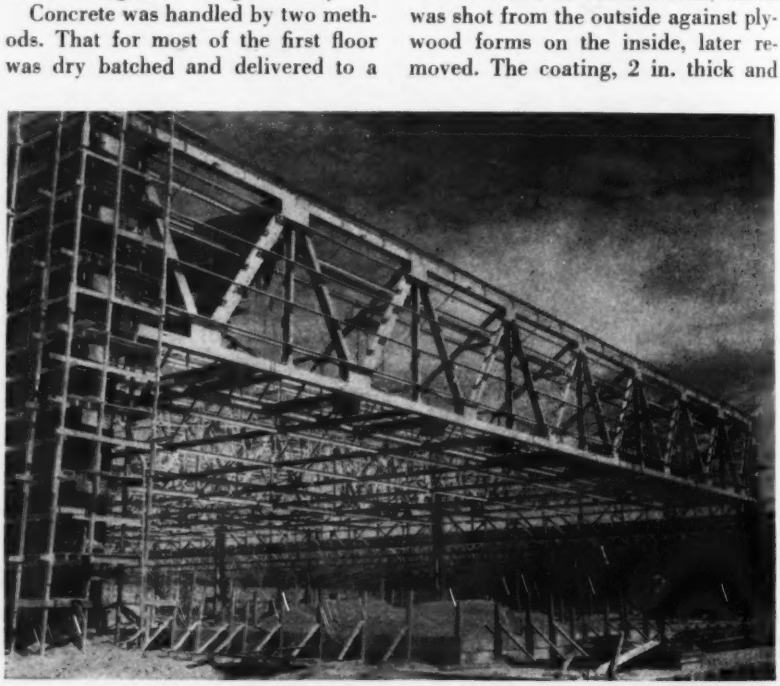
Contents in Brief—*A huge bomber assembly plant and plane testing field has been built on the western plains in the short time of nine months. The building is unusual in that it includes a full basement. Runway paving is asphalt-stabilized base with hot-mix asphalt surfacing. Nearly 5,000,000 cu. yd. of grading was required to level off the rolling site for the plant and airfield.*

SOME 5,000,000 cu. yd. of loess has been moved in flattening some of our Middle Western terrain to make way for a bomber assembly plant and an adjacent test field. From start to finish, the construction operations were disposed of in slightly less than nine months. That this is fast work is evident from the fact that the main building is a 600 x 900 ft. structure with full basement, that there are two 122 x 470-ft. hangars and that the runways, graded 500 ft. wide and paved 150 ft., total 14,800 ft. in length. Runway paving consists of asphalt-stabilized base with hot-mix asphalt surfacing, while aprons, taxiways and areas adjacent to the plant and hangars are of concrete.

The basement of the main plant is 15 ft. high, framed with concrete columns in 25-ft. square panels that support the flat slab main floor. Columns are founded on spread footings, and exterior walls up to about 8 ft. above first floor level are of concrete. All framing above the first floor is steel, columns being spaced 50 ft. longitudinally and 100 ft. transversely, except that along one end is a final assembly bay with a 200-ft. clear span. Spanning between the main 100-ft. trusses are lighter trusses, 25 ft. apart, that carry a monitor-type roof. Clearance from floor to bottom of trusses is 22 ft., except in the final assembly bay, where it is 28 ft. Two loading docks, 67 ft. wide, extend the full length of the building on each side, except for a 200-ft. opening at one end of the final assembly bay. There is one transverse expansion joint through the building, none longitudinally.

Concrete was handled by two methods. That for most of the first floor was dry batched and delivered to a concrete pump, where it was mixed and then pumped to place through a pipeline. Concrete for other parts of the structure was mixed at a central plant and hauled to the building by truck mixers.

Exterior walls are rather unusual. For the first eight feet above the main floor they are concrete. Above this is continuous steel window sash and vents, 5 ft. 2 in. high. Separating this row of sash from a second and similar row above is a band of air-applied concrete 3 ft. 5 in. wide. Between the sash and roof the walls are also of this material, which was shot from the outside against plywood forms on the inside, later removed. The coating, 2 in. thick and



Planes will roll out of this 200-ft. span final assembly bay directly onto the airfield for flight tests.

reinforced with 4x4-in. wire mesh supported on vertical and horizontal ¼-in. round rods, forms the entire wall without any interior finish.

The roof is metal deck, welded to the steel framing. It is insulated and covered with a composition roofing of paper, tar and gravel. Flooring in basement and main floor working areas is 2-in. wood block, totaling 1,008,000 sq. ft. or about 25 acres.

Ventilation and lighting

Except for certain offices and the cafeteria, the assembly plant is not air-conditioned. Ventilation will be through the sash and roof vents. Heating is by eleven hot-blast combination gas and oil-burning heater units. Each unit has a capacity of 85,000 cu. ft. of air per minute with a heat output of 6,250,000 B.t.u. per hour. The boiler plant will provide steam heat for the personnel building and process steam and compressed air for the main plant.

Fluorescent lighting is used in the basement, a total of 4,000 fixtures, each consisting of four 40-watt tubes, being required. On the main floor and loading docks, lighting is by some 4,000 incandescent fixtures mounted four to a bay. There are 770 fixtures of 1,000 watts each in the high 200-ft. final assembly bay and 2,780 fixtures of 750-watt capacity in the other portion of the building. Those on the loading docks are 500 watts each. The area outside the plant is lighted by 70 floodlights of 1,500 watts, mounted on the building parapet.

There are 250 miles of wiring in the building. Other building quantities include 46,000 cu. yd. of concrete, 4,800 tons of structural steel, 207,500 sq. ft. of steel sash, and 86,000 sq. ft. of air-applied concrete. There are 17,250 sq. ft. of doors including those for the 200-ft. assembly bay.

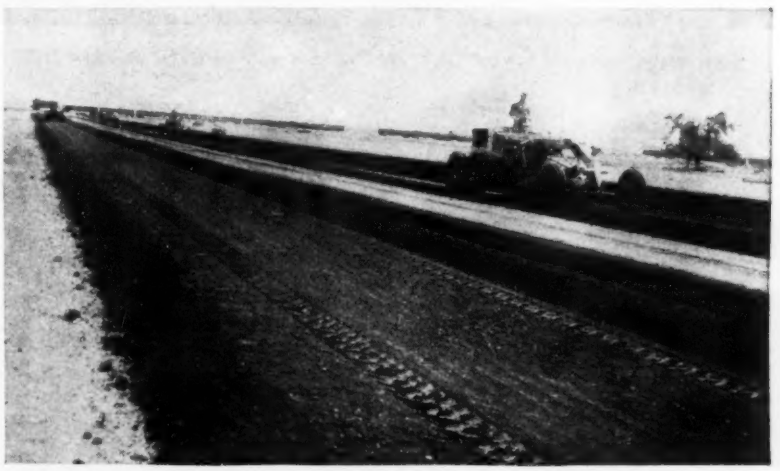
Grading and runways

About 4,800,000 cu. yd. of grading was required for the plant and runways. Cuts ran as deep as 60 ft., fills as high as 50 ft. Much of the airport is on fill. Shovels and elevated graders were used for excavation, loading into trailer dump units and trucks.

On runway fills the material was spread by bulldozers and motor graders. Then the 500-ft. base width was thoroughly compacted by tractors and sheepsfoot rollers. The stabilized base for the runways, 150 ft. wide, was built up in two 4-in. layers. A sand-gravel mixture was brought in from outside sources, with native loess being used as a filler. Then 4½ percent of emulsified asphalt was added to the aggregate by a traveling plant mixer. After mixing, the base material was shaped with graders and rolled with sheepsfoot and rubber-tired rollers. About 90 percent of the compaction effort was by the rubber-tired rollers. A 2-in. hot-mix asphalt surface was placed over the stabilized base, this material being supplied by a central mixing plant on the job. Runway paving amounted to 237,500 sq. yd.

Concrete paving, totaling 109,000 sq. yd., was placed by two pavers charged by dry batchers from a central plant. Paving was in strips, and complete highway finishing equipment was used. Other paving includes 95,000 sq. yd. of concrete highways and 140,000 sq. yd. of stabilized-base parking areas.

The old reliable elevating grader, a favorite western earth-mover, handled much of the five million yards of grading.



After emulsified asphalt was added to the runway bases the mix was shaped by graders; final surfacing was hot asphalt.

Utility services

Water will be supplied by an existing main from a nearby town. At such time as required this present supply will be supplemented either by construction of additional mains or by the development of an independent source of supply. Water pipe installation includes 10,700 ft. of 16-in. line.

Sanitary facilities consist of approximately 6,000 lin. ft. of sanitary sewers and a sewage disposal plant, the latter being built by WPA forces. There are 40,000 ft. of storm drains, including those serving the runways.

For protection of our country's interests, identification of the site and the personnel of the work must await the successful conclusion of the war.

Prestressed concrete water tank 106 ft. in dia.; height to overflow is 30 ft. and capacity is two million gallons.

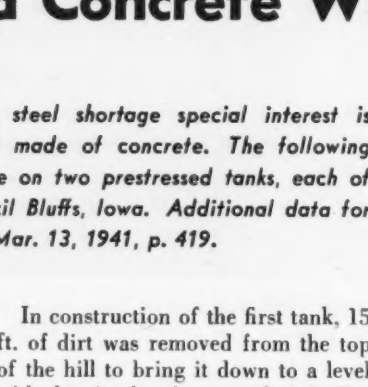
Prestressed Concrete Water Tanks

***Contents in Brief**—Because of the steel shortage special interest is attached to water storage structures made of concrete. The following article describes construction procedure on two prestressed tanks, each of two million gallons capacity, at Council Bluffs, Iowa. Additional data for this type of tank will be found in ENR Mar. 13, 1941, p. 419.*

TWIN CONCRETE RESERVOIRS, each of two million gallons capacity, are replacing an uncovered and structurally unsound reservoir that has supplied water to Council Bluffs, Iowa, for several years. One of the reservoirs has been completed by the Work Projects Administration and is in use, while on an adjacent hill construction is in progress on the second concrete structure. When completed, both tanks will be 236 ft. above the level of the town, maintaining a pressure of 85 to 90 lb. throughout the business district.

The tanks have an inside diameter of 106 ft., with a height to overflow of 30 ft. and a dome rise of 13½ ft. The specifications call for vertical joints in the walls, and definitely exclude horizontal joints, making this type of construction similar to a barrel. Prestressed steel bands in the wall, placed around a first thickness of 15 in. of concrete and covered with 4½ in. more on the outside, make a 19½-in. wall in which tension in the concrete is eliminated.

In construction of the first tank, 15 ft. of dirt was removed from the top of the hill to bring it down to a level with the site for the second tank. Excavation for the footings was made on good bearing ground, and the footings were poured annularly 4 ft. wide and 12 in. thick. The floor was then poured in concentric circles from the outside to the center, 7½ in. thick and with an outer edge of 15 in. All joints in the floor were depressed and the space filled with mortar before the tank was placed in service.



Prestressing the steel bands.

Pouring the wall

The inner 15-in. wall was poured to a full height of 30 ft. Three-tenths of the periphery was formed at one time, the forms being made of panels about 8 ft. square, constructed of 2 x 6-in. studs and ¾-in. sheathing, with the top and bottom plates cut to radius. The panels were held to line and plumb by wood frames bolted to the floor and extending up the full height of the wall forms.

In placing the concrete, one-tenth of the circumference was poured at one time, from the floor line to the top of the wall. The concrete was placed through holes 16 in. square, cut in the outer face of the form, in lifts of 8 ft. The concrete was consolidated with a mechanical vibrator.

After the pour was complete on three-tenths of the circumference, the panel forms were removed and placed in the next location around the circle. After three moves, sufficient panels were erected to complete closure of the remaining section of the wall and the final pour was made.

After the concrete shell had set, 74 round steel bands, $1\frac{3}{8}$ in. thick, consisting of ten rods each connected by turnbuckles, were placed around the wall and prestressed by means of the turn-buckles. The placing of these bands varied from 3 in., center to center, at the bottom to 12 in. at the top. The $4\frac{1}{2}$ in. of concrete outer wall provided full bearing for the round bands.

Forms for the $4\frac{1}{2}$-in. wall, covering the steel bands, were 4 x 15 ft., made of 2 x 4-in. studs and $\frac{3}{4}$-in. sheathing, lined with $\frac{3}{8}$-in. plywood panels glued to the sheathing. The concrete was poured in lifts of 3.8 ft., the forms being moved up as the work progressed.

Eighteen vertical spaces were left when the outer thickness was placed and pilasters were poured in these openings, from below the ground line to a point slightly above the top of the dome ring. The pilasters are intended to break the severe line of the dome ring and give a more pleasing appearance.

Framing the dome

In constructing the dome, the framing was supported on 111 wood posts, each consisting of three 2 x 6 timbers nailed together to form an H. These posts were topped with double 2 x 10-in. girders. The joists were cut to radius and assembled on the ground, with struts under the joints, wedged up on the girders when erected.

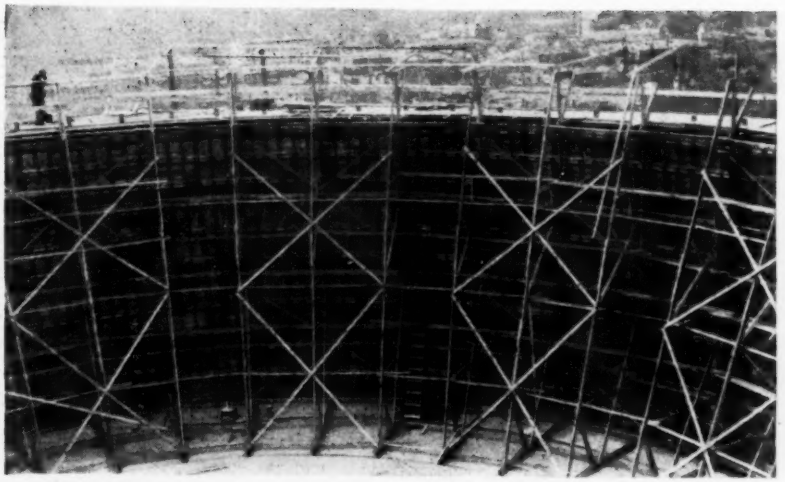
A dome ring bearing directly on top of the wall, separated by an asphalt joint, was placed in one pour, extending approximately 8 in. in on the dome curve, where a construction joint was made.

Before pouring the dome, nine steel bands were prestressed around the dome ring. The dome itself was poured in three sections, concentrically, the outer section being poured first. A small hole was left next to the dome ring wall, through which the form lumber was passed after stripping, and which will serve as an entrance with a steel ladder leading to the floor.

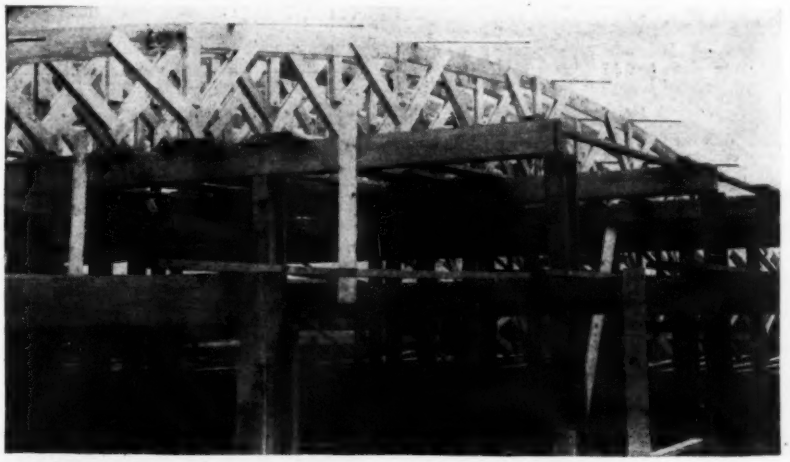
All forms used in construction of the first tank were so fabricated and numbered that they could readily be assembled for building the second tank.

Before the tank was placed in operation, all floor joints and vertical wall joints were filled with mortar, and the entire water surface was given several coats of metallic waterproofing. The vertical design of the walls has enabled them to withstand a static pressure of 30 ft. of water without leakage.

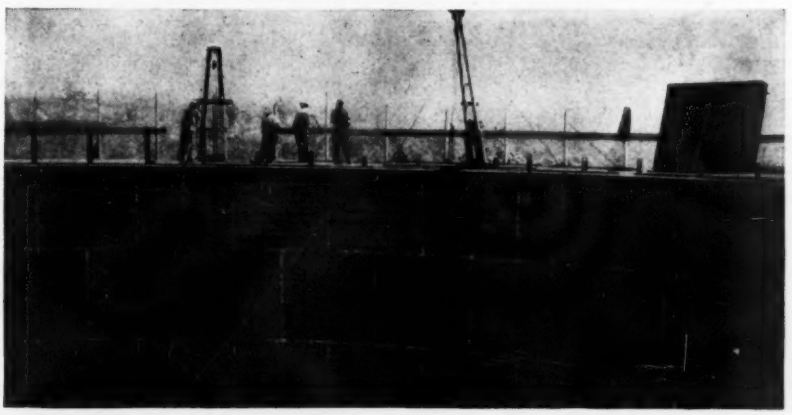
The reservoir was designed by William S. Hewett, consulting engineer, Chicago, and constructed by the WPA. General foreman for the WPA was R. P. Tallander. Construction was under the direction of F. B. Jensen, superintendent of the Council Bluffs Water Works.



In building the 15-in. wall, three-tenths of the periphery was formed at one time, the forms being made of panel sections about 8 ft. square.



Framing to support the forms for concrete dome construction was carried by 111 wood posts, each consisting of three 2x6's nailed together to form an H.



Inside view of completed 15-in. wall, which was poured to a height of 30 ft.

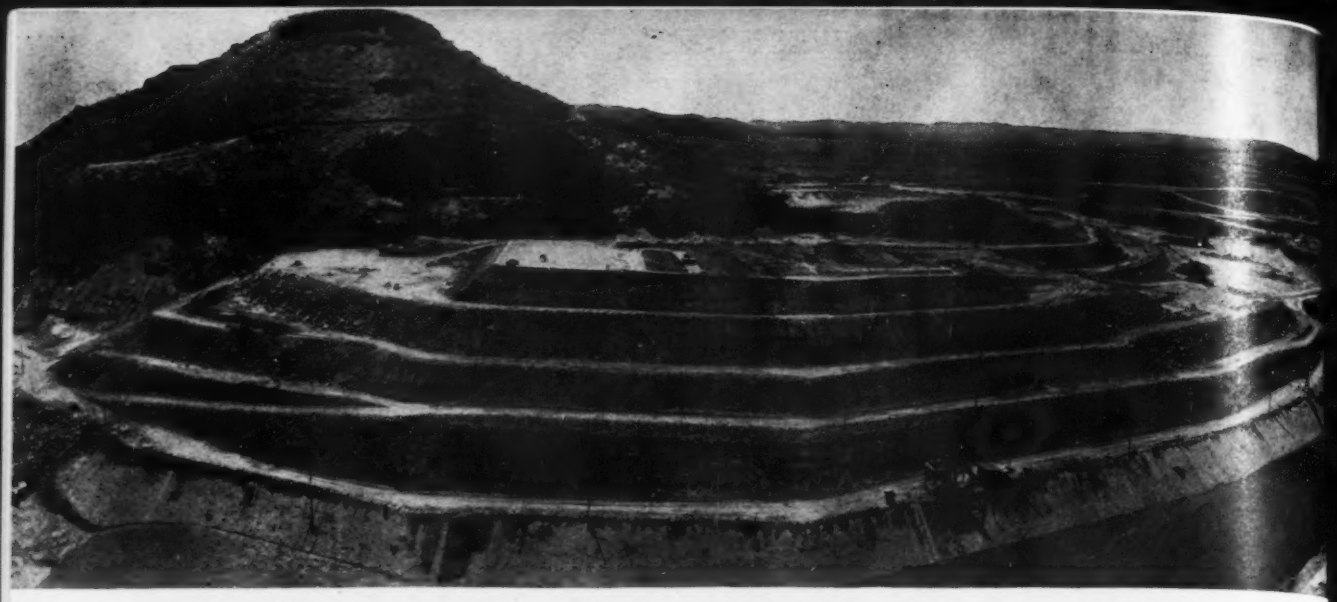


Fig. 1. Palmito Dam, on the Nazas River, will be 302 ft. high, base thickness 1,890 ft. and crest length of 1,082 ft.

Construction Hits New High in Mexico

A. N. Carter
Assistant Editor
Engineering News-Record

***Contents in Brief**—Now underway in Mexico is the largest construction program ever planned by that country. Irrigation work is increased one-third over last year, public building is greater, seventeen large power projects are under construction, road funds total one-half more than last year, and water supply and sanitation developments are on a bigger scale. Most of the required materials are manufactured in Mexico but a large share of the machinery and equipment is bought in the United States. Much of the design and construction procedure is similar to American practice.*

THIS YEAR the federal government of Mexico has underway the largest construction program in its history. In visiting that country one is impressed by the variety and size of many projects now being carried out. Our neighbor to the south also has its defense program, part of which will benefit the United States, as for example the extension of the Pan American Highway. There is also a private building boom, especially in the Mexico City area, where one sees construction underway in almost every block. Outlined below are the highlights of Mexico's increased construction as made known to the writer by the heads of various federal departments in a group of meetings at Mexico City arranged through the courtesy of Francisco Gomez-Perez, sub-director of coordination, Mexican National Irrigation Commission.

Many federal agencies have construction programs in progress, but four major types of work are being carried out, namely (1) a $15,000,000 irrigation program, (2) $30,000,000 of road construction, (3) one of the largest public building schedules ever planned, and (4) extensive hydro-electric work. In addition there is an increase in federal railroad, airport, water supply and sanitation work.

This year's irrigation program is about one-third greater than that of last year and more than double that of 1940. In this connection it is to be noted that the Commission of Irrigation of Mexico, which is in charge of the federal work, spent only $50,000,000 in the entire period of 1926 to 1940, and placed but 700,000 acres under irrigation during that time. Construction this year, which accounts for ten percent of Mexico's federal budget, includes six large dams, about twenty small dams, and several canals, including a 100-mile project in lower California with an 8,000-cfs. capacity at its upper end. Increase of wheat, corn, and cotton production to make Mexico self-sufficient in those crops is the planned objective.

Irrigation projects now underway represent the first part of President Avila Camacho's $80,000,000 six-year plan to provide water for 1,750,000 acres. The land, irrigated by projects built by the Commission of Irrigation, will total 2,450,000 acres. Some 16,000 workers, including 650 engineers, now are employed on irrigation construction.

One of the largest developments underway is the $12,000,000 Angostura Dam (Fig. 2) on the Yaqui River in the northern part of Mexico (*ENR* Nov. 20, 1941, p. 734). This project, which calls for a concrete arch of 291 ft. maximum height, is now nearing completion. The structure will provide 1,030,000 acre-feet of storage, including 949,000 acre-feet for irrigation and water for operation of a 16,300-hp. hydro-electric plant.

Another large structure is Palmito Dam (Fig. 1) on the Nazas River. This earthfill dam will be 302 ft. high with a crest length of 1,082 ft.

A total storage of 2,435,000 acre-ft. will be available, and of this amount 2,111,000 acre-ft. will be for irrigation and power and 830,000 acre-ft. for flood control. The power plant will have an installed capacity of 70,500 kva.

Except for projects near the United States boundary, for which it is cheaper to purchase materials in this country, all reinforcing steel and cement are manufactured in Mexico. During 1940 Mexican factories turned out $16,000,000 worth of steel and $4,250,000 worth of cement, while in 1941 production was increased to $17,000,000 and $5,500,000, respectively. However, all machinery for the irrigation projects, including gates and turbines, is purchased in the United States. In design of the dams, about $100,000 is spent annually on model studies at a Mexican City laboratory built in 1937; in this country work of a similar nature is carried out in the Denver laboratories of the U. S. Bureau of Reclamation. The dams under construction are reinforced concrete and combination earth-and-rockfill structures with about two-thirds of the latter type. They are being built in accordance with American practices.

American construction equipment

All necessary construction equipment for irrigation projects, which are mostly force-account jobs, also is purchased in the United States, and during 1941 $2,000,000 worth of construction machinery for irrigation purposes was ordered from American manufacturers. However, only about 60 percent of the orders could be filled, due to America's strenuous war efforts.

Power produced by irrigation dams completed before the end of 1941 was quite small, but the two largest projects now underway will provide over 100,000 hp., and when all current jobs are complete the total output will be increased greatly.

Biggest problems in Mexico's irrigation program are said to be: (1) lack of construction equipment and operating machinery and the difficulty of getting it from the United States; (2) delays and failures in obtaining repairs for the equipment already in service; (3) lack of cement—this shortage being more serious than the scarcity of steel; (4) an acute shortage of civil engineers and a scarcity of skilled workers, although common labor is plentiful.

Enlargement of existing Mexican cement plants, which include one of the first Latin American mills to produce low-heat cement, and construction of new plants are expected to eliminate one difficulty. Mexican engineering schools — now graduating about 100 engineers yearly who can be employed on irrigation projects— are expected to partially overcome another problem. (At present few American civil engineers are employed in Mexico, probably not over twenty.) The equipment and machinery problem, however, may become so acute as to affect greatly the irrigation work late this year and during following years.

About 60 airfields of all types have been constructed in Mexico, including four first-class fields built by Pan American Airways in cooperation with the federal government. The latter have 4,200-ft. long, 120 to 150-ft. wide asphaltic runways. All the fields were built in accordance with United States specifications and by methods similar to those employed in this country. This year's biggest project is to be construction of a first-class airport for Mexico City with runways over 5,000 ft. long, the longer runways being necessary because of the higher altitude and consequent lower air resistance at this location. In addition, four other fields are being improved, some of this work being done by Pan American and the balance as federal jobs or on a cooperative basis.

Last year $5,000,000 of federal funds was spent in Mexico for public buildings, this construction varying

Fig. 2. One of the largest Mexican irrigation projects under construction is Angostura Dam on the Yaqui River. This 291-ft. high structure will provide 1,030,000 acre-ft. of storage.

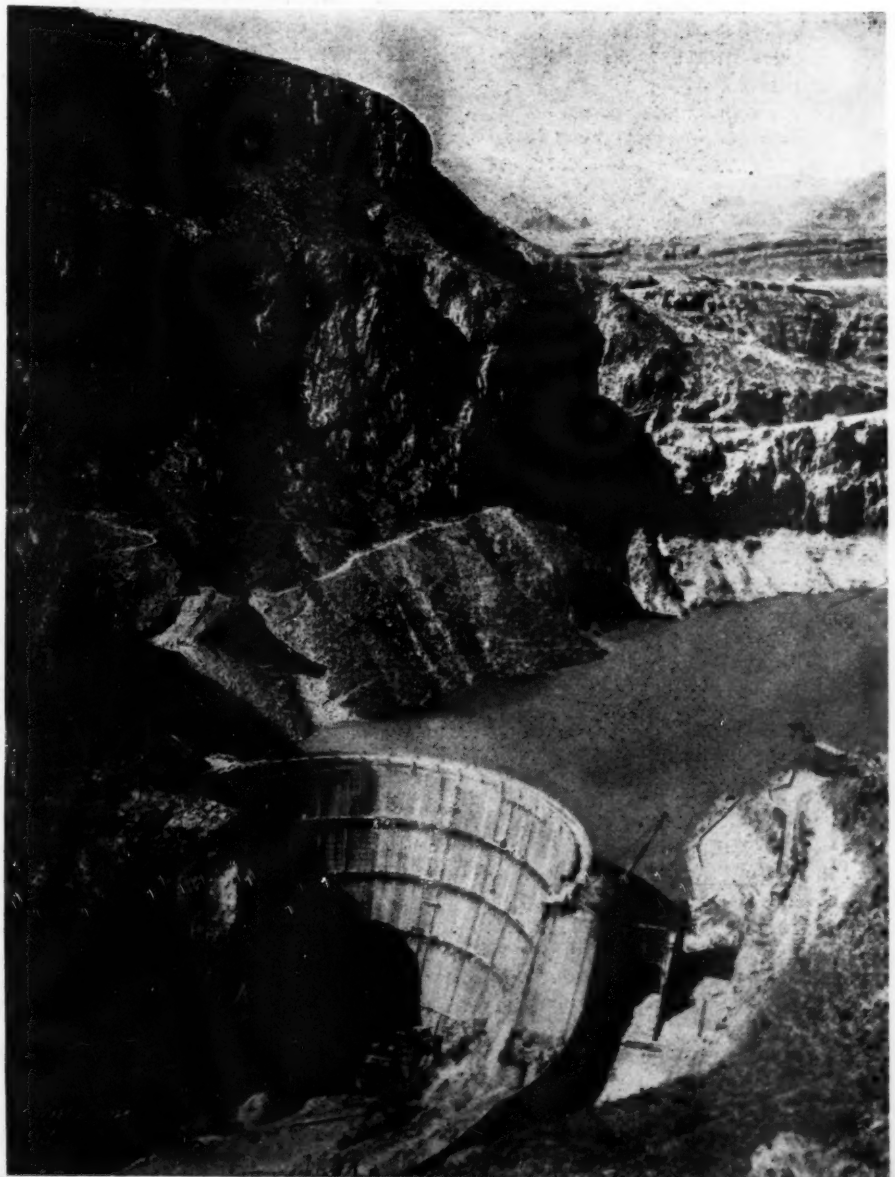


Fig. 3. Most recently completed waterworks improvements at Mexico City is this $2,500,000 steel-frame pumping plant with sandstone walls, glass-block pylons and a trim of volcanic stone.

in size from $1,000 schools and small post offices in the outlying districts to continued construction on a $2,500,000 army hospital at Mexico City. This was a big schedule when compared to that of past years, but this year another large program is planned. However, shortage of materials and construction equipment probably will reduce such work in 1943.

Although some public building has been done by force account and some by general contractor, the most satisfactory method has been for the federal government to employ a number of contractors. This is considered to be more desirable than employing one general contractor who sublets such parts of the work as plumbing, foundations, and electrical wiring. Most buildings of large size are of reinforced concrete or steel frame with brick walls and reinforced-concrete floors. These structures are similar to American buildings now being built.

Despite the size of the public building program private building bulks several times as large. This fact is revealed by a visit to Mexico City, where some type of a building project is underway virtually in every block.

Water supply work tripled

The Mexican federal budget for 1942 water supply improvements is $3,000,000, as compared to $1,000,000 during 1941 and $200,000 in 1940. Most federal funds are spent in an arrangement whereby the state and federal governments share the cost equally. The projects, being confined to towns and the smaller cities, are of relatively small size. Construction, which is either by force account or general contract and in accordance with standards of the American Water Works Association, is supervised jointly in each state by a federal representative and by a state supervisor appointed by the state governor. The federal sanitation staff employed on waterworks construction includes 94 engineers and 3,000 other workers. The funds received by a state depend not upon a state's area or population but upon its needs as determined by the sanitation and water supply branch of the Mexican Department of Public Health.

Waterworks improvements are of three general classes, namely (1) installation of wells, (2) construction of storage reservoirs, and (3) improvement of spring supplies. The latter work accounted for most of last year's expenditures when 48 projects were carried out at a cost of four to six dollars per person, the cost per capita being high because of the small scope of many jobs. At present only about eight percent of Mexican cities and towns of over 1,000 population have an adequate water supply, and this year 73 supplies are to be improved. For the water supply work much American-made pipe and equipment is used, although some Mexican and English chlorinators are being installed and some asbestos-cement pipe manufactured in Mexico is employed.

Limited sanitation work

The federal sanitation program is also carried out by the sanitation and water supply branch of the Mexican Public Health Department. Only $150,000 has been provided for such construction during 1942, but this is fifty percent greater than last year's budget. The sanitation work also includes rural hygiene, although little can be done with so small an appropriation.

None of the smaller Mexican cities has sewage treatment facilities. While 15 or 20 larger cities have some form of a collecting system, only four large municipalities have treatment plants. Few cities have disposal works under construction. Furthermore, sanitation improvements are not expected to account for extensive construction during the next few years.

For the Mexico City area, the federal district, of which the city is a part, has underway $4,750,000 worth of water supply and sewage disposal construction, while the replacement of some existing structures and maintenance of others is expected to account for another $1,500,000 during 1942.

Last year 136 miles of water mains, including 3½ miles of 48-in. dia. and 5 miles of 20-in. dia. cast-iron pipe, and a $2,500,000 pumping plant were built for Mexico City. Most important water supply project this year is a 35-mile aqueduct costing $2,500,000; this work includes an 8½-mile tunnel and a 16,000-hp. power plant utilizing the available head of the gravity supply developed. The upper 12 to 13 miles of the aqueduct will tap spring water of excellent quality. When this project is completed in 1945, the total supply available for the federal district will be sufficient for 2½ million people. This will adequately meet the future needs of Mexico City, as the present population is 1,600,000.

In 1941 the federal district built 11 miles of main sewers, and about 100 miles of laterals. Major sewage project now underway at Mexico City is the construction of a 6-mile long, 20-ft. dia. tunnel that will form part of the city's outfall system. Sewage from Mexico City is disposed of, untreated, through an open channel, a 6-mile tunnel, a power plant utilizing the available head, and then into a stream emptying into the Gulf of Mexico. It is the tunnel portion of this system that is being replaced in order to gain much needed capacity. Completion of this work is expected in two years.

Other cities where extensive waterworks improvements are underway include: Monterrey, Vera Cruz, Pu-

ebla, Herronville, Acapulco, and Torreon. This work is not federally financed.

Power developments

From 1934 to the present, Mexican private electric utilities added but little new capacity, and by the end of 1941 they had a total capacity of but 500,000 kva.; about 80 percent of this was hydro and the remainder steam or diesel. Failure of the private companies to expand led to the formation in 1928 of the Mexican Hydro-electric Power Commission.

This organization now has eleven small dams complete, with a total capacity of less than 2,000 kva., but it has under construction 17 power projects and 275 miles of power lines. Work is financed by a federal 10-percent electric consumer's tax and a $2,500,000 bond issue. A second bond issue of the same size will soon be sold.

The largest hydro-electric project in the construction stage is the Ixtapantango work on the Tilostoc River about 75 miles from Mexico City. This job, which is aimed at relieving the power shortage in the Mexico City area, calls for construction of a large dam to provide a storage of 324,000 acre-feet, a small diversion dam, and then a small storage dam to provide 3,240 acre-ft. of storage, plus tunnels, a canal, and a powerhouse where three 31,000-kva. units will be installed. The first stage of the work is to be completed in September of this year, but the second cannot be finished before 1943, due to the many uncertainties as to material and machinery deliveries. The third stage will not be completed for some time. The estimated cost of equipment required for the second part is $1,100,000 and the cost of installation $400,000. Other work on the project makes the present program total $2,500,000. Previous expenditures were $3,200,000, including $1,200,000 for equipment ordered from the United States.

Pan American road speeded

With the increase of federal highway funds by one-half, making $30,000,000 available in 1942, many highway jobs are being speeded up. These include: extension of the Pan-American highway near the Guatamala border, construction in western Mexico of a highway to connect Nogales Senora with Mexico City, and the building of three roads in the Pacific Coast area. Originally the Pan-American highway was to be completed in 1945, but a much earlier completion date is now hoped for, and by the end of 1942 three-quarters of the route in Mexico should be completed.

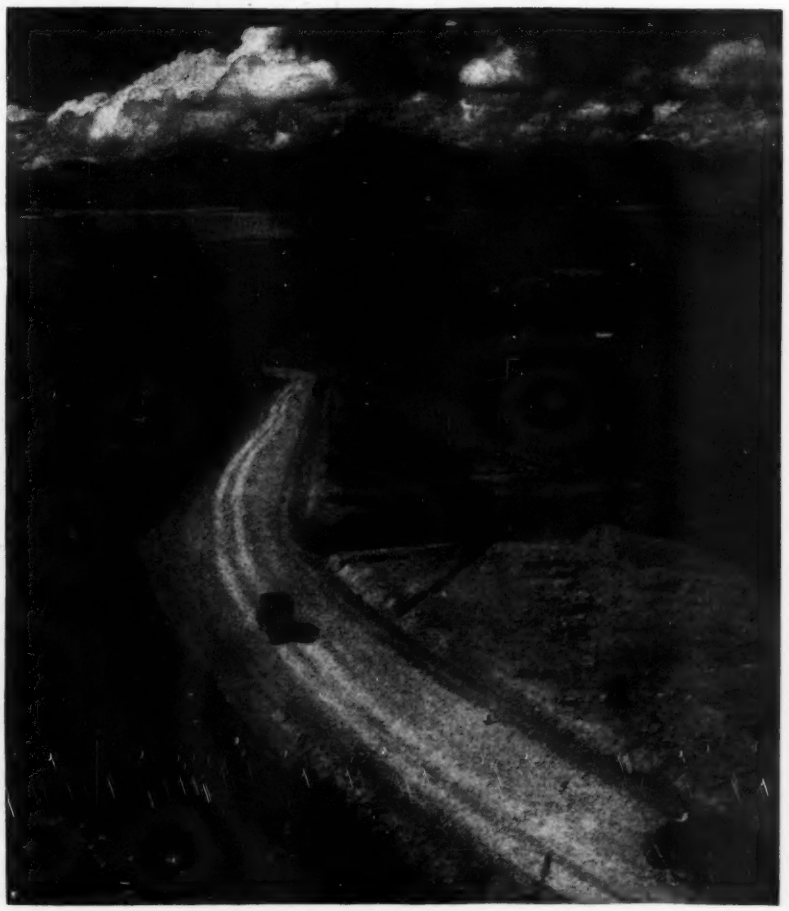
The three roads in the Pacific Coast area represent an expenditure of $4,000,000. One will connect the three important cities of Guadalajara, capitol of Jalisco state and second largest Mexican city, Autlan, and Barra de Navidad, which is a key location on the Pacific Coast in the state of Jalisco. This work will cost $2,500,000, and half of the expense will be paid by the state government. Work is scheduled to start early this month. The other two highways will be routes in lower California, and together will cost $1,500,000. One road will extend from Ensenada, which is just south of San Diego, Calif. along the Pacific Ocean to La Paz, capitol of the territory's southern district. The second will connect Mexicali at the border with La Paz.

At the end of 1941, highways built with federal funds totaled 6,765 miles and of this amount 3,250 miles are paved, 2,335 miles are surfaced with gravel or crushed stone and 1,180 miles are dirt. A total of 6,450 miles are laid out or planned for future construction.

Most Mexican paved highways are of bituminous construction, and roads are of two classes—those built entirely with federal funds, and those where the state government pays fifty percent. The federal government's funds are provided by bond issues and gasoline taxes. The tax accounts for eighty-five percent of the cost of gasoline in Mexico, and it made available over $20,000,000 in 1941.

The required construction machinery comes from the United States, and that imported for only maintenance and minor work since organization of the Mexican highway commission totals $1,250,000. Machinery

Fig. 4. Mexican engineers with federal funds have built 2,335 miles of highways of the type below or those surfaced with crushed stone or gravel. In addition 3,250 miles have been paved as federal projects.



purchased in this country by the general contractors doing road work in Mexico would be many times greater. Although Mexican road work has been granted an A-3 priority classification by the United States, orders for machinery now require six months to be filled by American manufacturers. Certain equipment repair parts are being manufactured in Mexico, but Mexican plants as yet do not produce many repair parts, such as rubber tires over 24 in. in rim size. The highway program will need to be cut drastically next year if imports are not obtained promptly.

Cost of the highway earthwork varies from $5,000 per mile in level country to $26,000 in mountainous area. Paving costs are about $8,000 per mile, and culverts and small drains total about $3,200 per mile, while bridges cost about $250 per lin. ft. Maintenance costs average $800 per mile per year, and the shoulders and embankments are usually maintained with hand labor.

A standard pavement width of 20¼ ft. is used, but for the larger bridges, some of which are a good size, a roadway width of only 18 ft. is provided. This is to save materials and means that for wide vehicles, such as large trucks, only one way traffic is possible. The smaller bridges are of reinforced concrete, while those over 60 ft. in length are of steel truss construction with most of the steel coming from plants at Monterrey. Very little steel is imported for bridges.

In conclusion it should be pointed out that not only is the federal construction program the largest in Mexico's history but that all projects, large and small, are based upon careful planning and good engineering practice. The war, of course, may delay parts of this work but there is every reason to believe that the present rapid advancement in civil engineering will continue. The most noticeable results will probably be in the nation's highway network, but much can also be expected from the irrigation, water supply, sanitation, and hydroelectric work now under construction or planned. Likewise, if the recently announced plan is carried out whereby Mexico and this country are to collaborate in building Mexican plants to produce war goods, the resulting steel mills, oil refineries, shipyards, docks, and railroad improvements should give Mexican engineers still more opportunity to demonstrate their abilities.

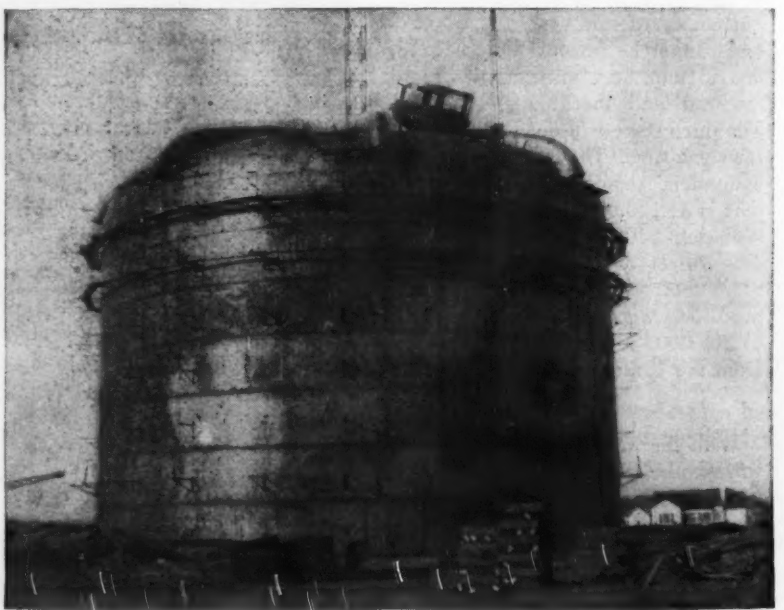
Exterior Ribs Feature Welded Tank

***Contents in Brief**—In a residential area the city of Tulsa, Okla., completed recently a 2,500,000-gal. all-welded steel water reservoir of an unusually pleasing design. The tank is 85 ft. in dia., 77 ft. in height, and is exceptional in that eight vertical exterior ribs extend up over the top to help support the ellipsoidal roof and ornamental cupola.*

A NEW 2,500,000-GAL. reservoir built by the Tulsa, Okla., water department to meet increasing water demands had to be pleasing in appearance because of its residential location. Extensive studies to obtain a satisfactory design resulted in an all-welded, steel tank that has eight exterior ribs to break up the large surfaces and to aid in supporting the ellipsoidal dome and ornamental cupola. This resulted in a structure that avoids the appearance of a standpipe, and at the same time is considered economical, as the total cost was but $50,000.

The tank is 85 ft. in dia. and 77 ft. in height. Its $\frac{3}{8}$-in. thick steel bottom rests on a 6-in. thick reinforced-concrete slab increased at the edges to form a curb 2½ ft. high and 1 to 1½ ft. wide. Over the slab a 2-in. cushion of oiled sand is employed for uniform load distribution. Seven 7½-ft. high steel rings varying in thickness from $\frac{3}{8}$ to $\frac{1}{2}$ in. at the bottom to ¼ in. at the top are used for the sidewalls, while ¼-in. plates are employed for the dome. Equally spaced around the tank's exterior are eight hollow, U-shaped ribs made up of $\frac{3}{16}$-in. plate. The ribs extend 3 ft. beyond the edge of the tank and their curved portions are bent to a 1½-ft. radius.

One of the ribs encloses a 15-in. dia. pipe to carry away the discharge from the overflow. This opening is 1x2 ft. with its lower edge 6 in. above



Roy Seal Photo

Fig. 1. The 13-ft. dia. cupola was last roof member to go into place. Portions of exterior ribs over dome are erected before bottom sections.

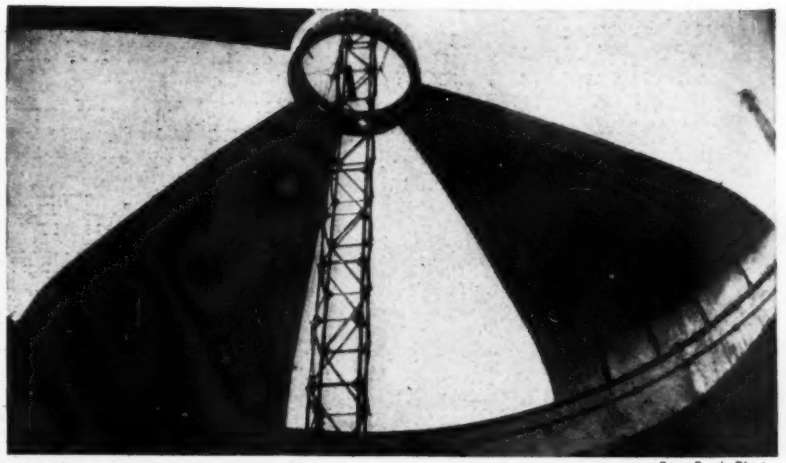
the high-water line, which in turn is 60 ft. above the base to allow the lower 7½ ft. of the dome to be used for storage. A second rib encloses a ladder leading up the side of the tank to an opening that permits entrance to the tank near the top for painting and other work. All of the ribs aid in supporting the ¼-in. steel-plate dome and they extend up to a 12-ft. dia. compression ring. This ring section is surmounted by a 13-ft. dia. cupola made up of $\frac{3}{16}$-in. plate to provide eight 2x3-ft. screened windows. The dome is also stiffened by angle bracing welded to the roof plates on the inside (Fig. 2).

In constructing the tank a steel-frame tower at the reservoir's center and a steel gin pole outside were employed. Construction required about three months, and the exterior wall rings were erected in several sections, while the dome was erected in eight sectors. Before this latter work was started, however, the compression ring, which was shipped in two sections, was assembled around the base of the tower and raised into position. The cupola was placed following erection of the compression ring, the eight dome sections, and upper portion of the ribs. Erection of the cupola is shown by Fig. 1, which also reveals that the lower portions of the exterior ribs were raised last.

The tank named the Anderson Reservoir in honor of the late W. F. Anderson, superintendent of the Tulsa waterworks from 1922 to 1935, is painted on the outside with a white paint over a red lead base. This is to make the structure harmonize with the nearby residences and to keep the water cool during the summer months. An aluminum exterior paint was considered undesirable, since it would give an industrial appearance to the tank.

Another interesting part of the work was determination of the tank's most advantageous location. This was evaluated by a flow analysis of Tulsa's distribution system by A. B. Jewell, assistant superintendent of the city's water department. This analysis was made with the aid of the Hardy Cross method. Among other things, the study revealed that the distribution system had a value of 120 for C in the Hazen & Williams formula.

Chicago Bridge & Iron Co., with Roy Seal, foreman, built the tank. W. F. Murry is superintendent of the water department.



Roy Seal Photo

Fig. 2. In building the dome, the 12-ft. dia. compression ring was erected first followed by the eight roof sections. Bracing on underside of roof, such as that shown above, aids exterior ribs (illustrated below) in supporting dome.

Fig. 3. Tulsa's new reservoir provides 2,500,000 gal. of storage and is painted white to harmonize with nearby residences. Vertical ribs or pilasters not only add to the tank's appearance by breaking up the outer surface, but they also aid in supporting the dome.

Nickel Plate R.R. bridge at Lorain, Ohio, built about 1904. The timber fender has been replaced by a steel one.

Welded Steel Fender Pier

Geo. H. Tinker
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***Contents in Brief**—A welded steel fender pier, braced with batter piles and having a truss section at the bridge pier it protects, now guides waterborne carriers under the Nickel Plate R. R. bridge at Lorain, Ohio. The author's first work with the Nickekl Plate was on the construction of this bridge, and his last, some 36 years later, was the design of the new fender protection, made necessary by changing conditions and a deepened channel.*

A WELDED STEEL FENDER PIER, with a field-assembled shallow truss at the bridge pier it protects, has replaced an old and often-repaired timber fender built in 1904 on the Black River at Lorain, Ohio. Changes in conditions at the bridge site, culminated by dredging which removed the supporting material for the timber fender, dictated a change to a different type of structure. The experience gained in more than thirty years of maintaining similar structures at this and other locations influenced the design, not only in its details, but of the structure as a whole.

When the 340-ft. through, swing span over Black River on the line of the Nickel Plate R. R. was built in 1904, the timber fender pier was constructed on the channel side of the center pier, there being a channel under but one arm of the bridge. The fender pier consisted of a single line of wood piles braced at intervals by pile bents extending 25 ft. on the side opposite the channel and at right angles to the channel. Timber wales were used on both the channel and rear faces of the fender piles.

The center, or swing, pier of the bridge rests on piles. However, the soft material of the river bottom is underlain by shale having both a steep dip and pitch, so that the pier on the opposite side of the channel, which supports one end of the swing span in closed position, is founded directly on rock. River traffic past the bridge is mostly deeply-laden lake vessels loaded with iron ore and being moved upstream by one or two tugs, although there are some downstream cargoes of coal.

There is an angle in the channel of 4½ deg. directly under the bridge, and a considerable bend to the west a short distance upstream. The crookedness of the channel, together with the influence of wind and current, at times make handling the large and heavy vessels difficult. Vessels moving downstream light, sometimes only under their own power, occasionally have trouble straightening out in the thousand or so feet above the bridge and in passing the fender pier without collision. Loaded vessels moving upstream also sometimes collide with the pier. In the course of years the fender has been damaged many times.

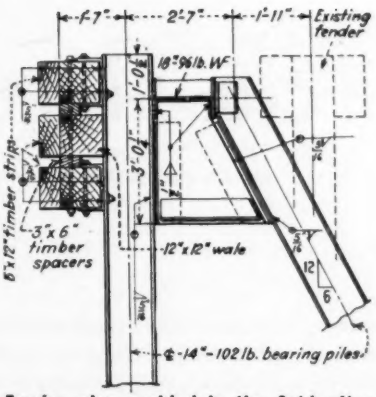
The fender was kept in repair by replacing broken wales, driving more piles and wedging between the rear wales and the bracing bents. As larger and larger lake vessels were built and the channel was dredged deeper and deeper, the support for the fender became less satisfactory

and more expensive to maintain, until dredging of the channel to a depth of 26 ft. made it apparent that the time for rebuilding had arrived.

The last dredging was in soft rock to a lower elevation than the ends of the old fender piles and as close to the pier as the dipper could be worked. Presumably the material in front of the piles had sloughed away and so reduced the holding ground for new piles. Pulling the old piles, many of them broken, was thought likely to further disturb the bottom, making it questionable if adequate support existed for the new piles. The new protection fender could not be driven back of the old as there was no room in front of the center pier.

Steel H-piles have been successfully driven into soft rock, so permission was secured from the U. S. District Engineer to drive a line of such piles on the channel side of the old pier sufficiently removed to accommodate a shallow horizontal truss in front of the center pier. The Lake Carriers' Association made no objection to this construction.

The piles used are 14-in., 102-lb. H-beams driven 1 to 4 ft. into the soft rock at 4-ft. centers. An 18-in., 96-lb., wide-flange beam is welded to the shore-side flanges to distribute the effect of impact from a collision and to hold the piles to line. Every 12 ft. a batter pile, weld connected to the steel wale, gives lateral stiffness to the fender pier.



Fender pier, welded in the field after piles were driven into soft rock.

members were shop welded and the connections to the compression chord field welded. Vertical piles under the panel points of the tension chord support the truss in a horizontal plane.

On the channel side of the fender pier three lines of 12-in. timber wales are supported by 8x6x½-in. angles, bolted and welded to the flanges of the H-beam piles. The timbers are fastened to the angles by vertical bolts through the horizontal legs of the angles. White-oak wearing strips, 6x12 in., are then fastened to the 12x12-in. wales by horizontal bolts with the heads recessed in counterbored holes. Experience has shown that projecting bolt heads may be fouled by a passing vessel, shearing the heads off, tearing the bolts loose or damaging the vessel. The reason for three wales, where one would usually be sufficient, is that lake vessels are constructed with longitudinal frames and the greater bearing area reduces bending or crushing of the plates between the frames.

On the opposite side of the channel the river is shallow from the shore to beyond the pier that supports one end of the swing span, when in closed position, and a short approach span. Vessels naturally avoid the shallow water but little damage would result from a collision between a vessel and this pier, and the damage could be quickly repaired. The protection here consists of timber in direct contact with the concrete shaft, extending far enough out to prevent a vessel from fouling.

The steel fender pier and protection were designed by the author. During the preparation of the plans for the welded pier helpful suggestions were received from the district and division offices of the U. S. Engineer Department and from the Lake Carriers' Association. The pier was built, during the closed navigation season, by the American Construction Co. of Cleveland at a cost of about $30,000. Charles Peterson was superintendent for the contractor. Construction was under the supervision of F. S. Hales, bridge engineer, and A. C. Harvey, chief engineer of the Nickel Plate R. R. F. M. Spiegel was in charge in the field.

Truss at the bridge pier

The center pier, on a pile foundation, carries the entire weight of the superstructure in open position, including operating machinery. It was considered advisable to avoid, as far as possible, any shock to the pier with consequent danger of damage to the superstructure or derangement of the machinery. Hence, the long fender pier protecting the ends of the span and the horizontal truss in front of the pier itself prevents contact with the bridge structure where batter piles could not be driven.

The truss is 41 ft. long, 3 ft. deep at one end, and 3 ft. 3⅞ in. at the other end. It uses the 18-in. steel wale regularly welded to the shore side of the flanges as the compression chord. The truss has a 12-in., 72-lb., wide-flange beam as a tension chord, and the web members are all 10-in., 60-lb. wide-flange beams. The connections of the tension chord and of the web

Welded horizontal truss at the pier using the beam of the fender for one member of the truss. The angle in the channel line and the abrupt bend in the background contribute to navigation difficulties that cause damage to the fender.

Quantities of Cylindrical Intersections

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***Contents in Brief**—In water supply, subway, and much other construction, long involved computations are often necessary to calculate the areas and volumes at intersecting cylinders. This article, after developing formulas for calculating the volume common to two interesting cylinders and formulas for determining the surface area cut from one cylinder by the intersection of another, makes available tables that permit rapid calculations instead of the tedious work ordinarily required. Applications are also illustrated.*

One of the difficult problems confronting the engineer engaged in computing quantities is the determination of areas, volumes and weights at intersecting cylinders. Such problems frequently arise in water supply, subway, and tunnel construction. Examples of the many different cases include the intersection of shafts, drifts and tunnels; the junction of two intersecting circular arches; and an eccentric spur in the main line of special pipe castings. These problems can be treated mathematically, but the solutions are generally too cumbersome for practical use and require the application of tabulated values of special functions. Partial solutions of this problem have been obtained from time to time, but most of these are lengthy in their application and require the computation of several factors. The following is a general solution with tables, that permits rapid calculation.

In computing volumes of two intersecting cylinders, the procedure is to compute the volume of each cylinder independently and to add the two volumes. This sum is larger than the true volume by an amount equal to the common volume and this quantity must be deducted from the total. Determination of the common volume in the past has been difficult, but a quick method for this work will be described in detail.

Two circular cylinders of unequal radii intersecting eccentrically at right angles to each other and referred to three rectangular axes X, Y and Z are shown in Fig. 1. The radii of the larger and smaller cylinders are R and r, respectively, and the offset distance between their axes is h. This represents the general case, the two extreme cases being when the cylinders intersect axially and when they intersect tangentially. The equations of the larger and smaller cylinders are, respectively,

$$x^2 + y^2 = R^2 \text{ and } (x - h)^2 + z^2 = r^2$$

The common volume of an elementary section for the general case is given by

$$dV = yzdx = (\sqrt{R^2 - x^2}) \ (r^2 - \overline{x - h^2}) \ dx$$

The total common volume is represented by the integral expression

$$V = 4 \int_{h-r}^{h+r} \sqrt{(R^2 - x^2) \ (r^2 - \overline{x - h^2})} \ dx$$

An exact mathematical solution of this problem leads to elliptic integrals. For this work let

$j = \frac{r}{R}$ = ratio of radii of cylinders;

$e = \frac{h}{R}$; $k^2 = \frac{4j}{(1+j)^2 - e^2}$;

θ = angle whose sine is k;

Φ = angle whose sine is $\sqrt{\frac{1+j-e}{2}}$;

$$F = \int_0^{\Phi} \sqrt{\frac{d\phi}{1 - k^2 \sin^2 \phi}}$$

or incomplete elliptic integral of first kind;

$$K = \int_0^{\frac{\pi}{2}} \sqrt{\frac{d\phi}{1 - k^2 \sin^2 \phi}} =$$

complete elliptic integral of first kind;

$$E_\phi = \int_0^{\phi} \sqrt{1 - k^2 \sin^2 \phi} \ d\phi =$$

incomplete elliptic integral of second kind; and

$$E = \int_0^{\frac{\pi}{2}} \sqrt{1 - k^2 \sin^2 \phi} \ d\phi =$$

complete elliptic integral of second kind.

The expression for the common volume is

$$V = \frac{8}{3} r^2 R \left\{ \frac{1}{j^2} \left[\frac{2 + 2j^2 + e^2}{4} \sqrt{(1+j)^2 - e^2} \ E - \frac{1 - j + e}{1 + j + e} \frac{2 - 2j^2 + 2je + e^2}{4} \sqrt{(1+j)^2 - e^2} \ K + \frac{3}{2} e \ (1 - j^2) \ (K E_\phi - EF) \right] \right\}$$

$$= \frac{8}{3} C_v r^2 R,$$

where C_v is the value of the bracketed expression.

Fig. 1. Intersection of circular cylinders of unequal radii with axes not in same plane.

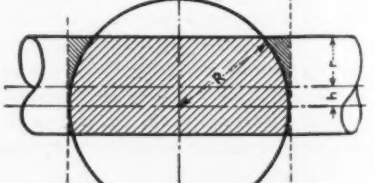


Fig. 2. When cylinders intersect as above, the volume common to both cylinders equals $\frac{8}{3}$ C_v r^2 R and the volume of small cylinder between planes M-M and outside large cylinder equals r^2R $(2\pi - 8/3\,C_v)$. Factor C_v may be obtained from Table I.

When the two cylinders intersect so that an element of each is tangent to same plane, $h = R - r$ and $e = 1 - j$ and the expression for the common volume reduces to:

$$V = \frac{8}{3} r^3 R \left\{ \frac{1}{j^2} \left[\frac{\sqrt{J}\,(3 - 2j + 3j^2)}{2} - \frac{3}{4}(1+j)\,(1-j)^3 \log_e \frac{1+\sqrt{j}}{1-\sqrt{j}} \right] \right\} = \frac{8}{3} C_v r^3 R$$

When the two cylinders intersect axially, h and e are equal to zero and the expression for the common volume reduces to:

$$V = \frac{8}{3} r^3 R \left\{ (K + E - \left(\frac{K - E}{j^2} \right) \right\} = \frac{8}{3} C_v r^3 R$$

E and K in this case are functions of j instead of k.

Lastly when the two cylinders intersect axially and are of the same radius, $R = r$, and $j = 1$ and the common volume is given by

$$V = \frac{16}{3} R^3, \text{ since } C_v = 2$$

The elliptic integrals F, K, $E\phi$ and E were calculated at great labor to ten places by the great French mathematician Legendre and the computations tabulated for values of θ and ϕ for every degree from 0 to 90. They are to be found in Volume 2 of his work, "Traité des Fonctions Elliptiques," Paris, 1826. A recent reprint of these tables was issued by the Biometrika Office, University College, London, and printed at the Cambridge University Press, 1934, with an introduction by K. Pearson. Shorter tables are found in various works which treat this subject.

The values of the elliptic functions in the formula for common volume of intersecting cylinders were computed by the writer from Legendre's tables for values of j and e varying by increments of 0.05 from 0 to 1. In doubtful cases of interpolation, the functions were computed directly. These values and their coefficients were substituted in the bracketed expression of the formula for common volume and tabulated in Table I. In order to obtain the common volume of any two circular cylinders intersecting at right angles, determine the values of j and e for this case, interpolate an appropriate value C_v in the table and multiply by $\frac{8}{3} r^3 R$. A numerical example is worked out later.

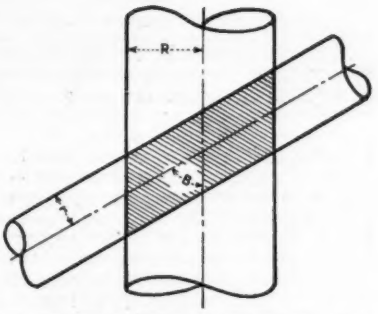


Fig. 3. When cylinders intersect at an angle B less than 90 deg. The volume common to both cylinders equals $\frac{1}{\sin B}\left(\frac{8}{3}\right) C_v r^3 R$. ***The value of*** C_v ***may be obtained from Table I.***

Quite often it is required to determine the volume of a small cylinder external to a large cylinder and included within tangent planes to the latter (Fig. 2). The volume in this case is: $V = (2\pi - \frac{8}{3} C_v) r^3 R$

When the two cylinders intersect at an angle B less than 90 deg. (Fig. 3) the common volume between the cylinders is $V = \frac{1}{\sin B} \frac{8}{3} C_v r^3 R$

Use of tables

In order to illustrate application of the tables, let it be required to compute the weight of a steel casting consisting of a 48x36-in. tee with a 20-in. manhole and a 12-in. blowoff of the type and dimensions shown in Fig. 4. The method followed is to compute separately the exterior and interior volumes of the casting or to consider the casting solid with first the outside dimensions and then of the inside dimensions and solid. The difference between the two volumes gives the casting's volume and makes possible the determination of the casting's weight. In this example hubs and flanges are omitted.

The solid volume of the 48-in. dia. main line using the outside dimensions $= \pi\ (26)^2\ (58) = 123{,}175.6$ cu.in. For the 36-in. diameter branch $j = \frac{19.75}{26} = 0.7596$; $e = O$; and $C_v = 2.1708$. Now the branch's total volume $= \pi\ (19.75)^2\ 35 = 42{,}889.6$ cu.in., while the common volume is $\frac{1}{2} \times \frac{8}{3}$ x $2.1708\ (19.75)^2\ 26 = 29{,}353.9$ cu.in. Thus, the volume outside the 48-in. pipe equals 13,535.7 cu.in. With the 20-in. dia. manhole $j = \frac{11.25}{26} = 0.4327$; $e = O$; and $C_v = 2.2995$ and the total solid volume equals $\pi\ (11.25)^2\ 30 = 11{,}928.2$ cu.in., that common to the 48-in. pipe equals $\frac{1}{2} \times \frac{8}{3}$ x $2.2995\ (11.25)^2\ 26 = 10{,}089.1$ cu.in., and the volume outside the 48-in. cylinder equals 1,839.1 cu.in. For the 12-in. dia. blowoff $j = \frac{6.875}{26} = 0.2644$; $e = \frac{18}{26} = 0.6923$; and $C_v = 1.6354$. The solid volume equals $\pi\ (6.875)^2\ 30 = 4{,}454.7$ cu.in., the volume common to 48-in. cylinder equals $\frac{1}{2} \times \frac{8}{3}$ x $1.6354\ (6.875)^2\ 26 = 2.679.7$ cu.in., and the volume outside the 48-in. pipe equals 1,775.0 cu.in. Therefore the total volume of the casting, if it were solid and of the outside dimensions, is 140,325.4 cu.in.

Calculation of the casting's volume if it were solid and of the interior dimensions shows the volume of the main line equals $\pi\ (24)^2\ 58 = 104{,}954.3$ cu.in. For the 36-in. branch $j = \frac{18}{24} = 0.75$; $e = O$; and $C_v = 2.1761$. The branch's total volume is $\pi\ (18)^2\ 35 = 35{,}625.7$ cu.in. and

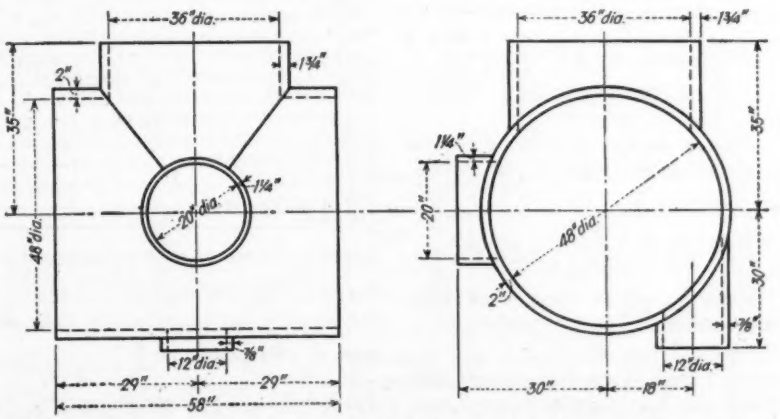


Fig. 4. Special steel casting made up of 48x36-in. tee with 20-in. manhole and 12-in. blowoff. Hubs and flanges are omitted.

the volume common to the main line is $\frac{1}{2} \times \frac{8}{3}$ x 2.1761 $(18)^2$ 24 = 22,561.8 cu.in. Thus, the branch's volume outside the main line is 13,063.9 cu.in. For the manhole $j = \frac{10}{24} = 0.4167$; $e = O$; and $C_v = 2.3037$. The manhole's total volume equals π $(10)^2$ 30 = 9,424.8 cu.in., the volume common to the 48-in. line is $\frac{1}{2} \times \frac{8}{3}$ x 2.3037 $(10)^2$ 24 = 7,371.8 cu.in.. and the volume outside the main line equals 2,053.0 cu.in. With the blowoff $j = \frac{6}{24} = 0.25$; $e = \frac{18}{24} = 0.75$: and $C_v = 1.4805$. This makes the blowoff's total volume equal to π $(6)^2$ 30 = 3,392.9 cu.in. and the common volume $\frac{1}{2} \times \frac{8}{3}$ x 1.4805 $(6)^2$ 24 = 1,705.5 cu.in. or the volume outside main line 1,687.4 cu.in. Thus, the total volume of the casting, if it were of the inside dimensions and solid, is 121,758.6 cu.in. Therefore, the actual volume of the steel casting equals 140,325.4 — 121,758.6 or 18,566.8 cu.in.

The weight of the steel casting is 18,566.8 x 0.2833 or 5,260 lb.

Areas with intersecting cylinders

The determination of the surface of a cylinder cut out by another of different radii intersecting eccentrically at right angles is treated similarly to the determination of common volumes. The solution will be indicated both for the surface cut out of the larger and for that cut out of the smaller.

Let S_{ma} denote the surface of the larger circular cylinder cut out by the smaller one. Then for the general case of

$j = \frac{r}{R}$ and $e = \frac{h}{R}$ the area equals $S_{ma} =$

$$4R^2 \left[\sqrt{(1+J)^2 - e^2}\, E - \frac{1-j+e}{1+j+e} \sqrt{(1+j)^2 - e^2}\, K + 2\, e\, (K E_\phi - EF) \right] = 4 C_{ma} R^2.$$

When $h = R - r$ or the cylinders intersect tangentially

$$S_{ma} = 4R^2 \left[2\sqrt{j} - (1-j) \log_e \frac{1+\sqrt{J}}{1-\sqrt{J}} \right] = 4\, C_{ma}\, R^2$$

When $h = O$ or there is an axial intersection $S_{ma} = 4R^2\ [2E - 2\ (1 - j^2)\ K] = 4\ C_{ma}\ R^2$, where E and K are functions of j instead of k. Lastly when $R = r$ $S_{ma} = 8R^2$, since $C_{ma} = 2$.

Now let S_{mi} denote the surface of the small circular cylinder cut out by the larger one. Then for the general case of $j = \frac{r}{R}$ and $e = \frac{h}{R}$

$$S_{mi} = 4\, Rr \left[\sqrt{(1+j)^2 - e^2}\, E + \frac{1-j+e}{1+j+e} \sqrt{(1+j)^2 - e^2}\, K - 2e\, (K\, E_\phi - EF) \right] = 4\, C_{mi}\, Rr$$

When $h = R - r$ (cylinders intersect tangentially), $S_{mi} =$

$$4\, Rr \left[2\sqrt{j} + (1-J) \log_e \frac{1+\sqrt{J}}{1-\sqrt{J}} \right] = 4\, C_{mi}\, Rr$$

When $h = O$ (axial intersection) $S_{mi} = 8Rr\ E = 4C_{mi}Rr$, since $C_{mi} =$

J \ e	0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
0.05	2.3553	2.3524	2.3437	2.3288	2.3078	2.2805	2.2469	2.2063	2.1585	2.1031	2.0393	1.9665	1.8835	1.7888	1.6804	1.5560	1.4121	1.2361	1.0193	0.7468
0.10	2.3532	2.3503	2.3414	2.3260	2.3046	2.2768	2.2442	2.2036	2.1556	2.1000	2.0360	1.9628	1.8790	1.7838	1.6745	1.5481	1.4011	1.2193	0.9921	
0.15	2.3496	2.3466	2.3376	2.3227	2.3018	2.2739	2.2390	2.1968	2.1500	2.0946	2.0303	1.9563	1.8716	1.7748	1.6635	1.5360	1.3901	1.2149		
0.20	2.3444	2.3413	2.3323	2.3173	2.2959	2.2680	2.2337	2.1925	2.1438	2.0870	2.0218	1.9467	1.8610	1.7620	1.6480	1.5130	1.3614			
0.25	2.3376	2.3346	2.3256	2.3103	2.2888	2.2606	2.2256	2.1835	2.1353	2.0775	2.0111	1.9350	1.8471	1.7453	1.6258	1.4865				
0.30	2.3294	2.3263	2.3171	2.3018	2.2801	2.2518	2.2165	2.1740	2.1239	2.0655	1.9976	1.9193	1.8289	1.7235	1.5960					
0.35	2.3195	2.3164	2.3071	2.2915	2.2694	2.2406	2.2048	2.1619	2.1106	2.0507	1.9811	1.9000	1.8051	1.6911						
0.40	2.3081	2.3048	2.2954	2.2796	2.2571	2.2277	2.1914	2.1471	2.0947	2.0333	1.9613	1.8769	1.7743							
0.45	2.2949	2.2917	2.2821	2.2659	2.2429	2.2131	2.1760	2.1305	2.0761	2.0121	1.9363	1.8456								
0.50	2.2801	2.2768	2.2666	2.2504	2.2268	2.1959	2.1576	2.1107	2.0546	1.9875	1.9066									
0.55	2.2638	2.2605	2.2499	2.2327	2.2090	2.1768	2.1378	2.0881	2.0289	1.9568										
0.60	2.2457	2.2411	2.2308	2.2131	2.1881	2.1551	2.1135	2.0619	1.9979											
0.65	2.2261	2.2205	2.2097	2.1913	2.1652	2.1305	2.0863	2.0306												
0.70	2.2043	2.1974	2.1861	2.1669	2.1394	2.1025	2.0542													
0.75	2.1791	2.1701	2.1608	2.1397	2.1101	2.0690														
0.80	2.1493	2.1401	2.1318	2.1090	2.0763															
0.85	2.1125	2.1030	2.0960	2.0739																
0.90	2.0633	2.0561	2.0618																	
0.95	2.0048	2.0304																		
1.00	2.0000																			

NOTE: This table gives value of C_v in formula $V = \frac{1}{2} C_v r^2 R$, where V is volume common to cylinders, R is radius of larger cylinder, and r radius of smaller. For finding C_v let j equal $\frac{r}{R}$ and e equal ratio of offset of cylinder axes to radius of large cylinder.

Table 1. Common volumes of circular cylinders intersecting at right angles.

J \ e	0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
0.05	0.0039	0.0039	0.0039	0.0040	0.0040	0.0041	0.0041	0.0042	0.0043	0.0044	0.0045	0.0047	0.0049	0.0052	0.0055	0.0059	0.0064	0.0070	0.0078	0.0091
0.10	0.0157	0.0157	0.0158	0.0159	0.0160	0.0163	0.0165	0.0169	0.0173	0.0176	0.0182	0.0189	0.0197	0.0208	0.0221	0.0242	0.0268	0.0311	0.0431	
0.15	0.0354	0.0355	0.0358	0.0359	0.0368	0.0366	0.0373	0.0379	0.0388	0.0398	0.0411	0.0427	0.0447	0.0473	0.0506	0.0552	0.0627	0.0800		
0.20	0.0631	0.0633	0.0639	0.0639	0.0645	0.0653	0.0663	0.0676	0.0692	0.0711	0.0736	0.0765	0.0809	0.0852	0.0920	0.1021	0.1245			
0.25	0.0990	0.0990	0.0995	0.1002	0.1011	0.1024	0.1041	0.1062	0.1089	0.1119	0.1161	0.1210	0.1275	0.1362	0.1488	0.1760				
0.30	0.1430	0.1432	0.1437	0.1449	0.1469	0.1496	0.1527	0.1558	0.1578	0.1627	0.1689	0.1768	0.1875	0.2049	0.2353					
0.35	0.1935	0.1938	0.1946	0.1961	0.2001	0.2029	0.2065	0.2111	0.2160	0.2240	0.2341	0.2458	0.2636	0.2990						
0.40	0.2567	0.2571	0.2582	0.2608	0.2630	0.2669	0.2719	0.2783	0.2865	0.2970	0.3111	0.3303	0.3703							
0.45	0.3268	0.3273	0.3289	0.3315	0.3359	0.3405	0.3463	0.3534	0.3630	0.3784	0.4063	0.4482								
0.50	0.4063	0.4070	0.4090	0.4126	0.4177	0.4248	0.4342	0.4465	0.4632	0.4871	0.5328									
0.55	0.4956	0.4964	0.4992	0.5037	0.5107	0.5202	0.5332	0.5507	0.5760	0.6246										
0.60	0.5952	0.5962	0.5999	0.6061	0.6153	0.6285	0.6466	0.6708	0.7138											
0.65	0.7059	0.7075	0.7128	0.7204	0.7329	0.7511	0.7782	0.8311												
0.70	0.8287	0.8305	0.8371	0.8483	0.8659	0.8930	0.9474													
0.75	0.9648	0.9677	0.9765	0.9922	1.0186	1.0736														
0.80	1.1161	1.1200	1.1326	1.1569	1.2126															
0.85	1.2852	1.2911	1.3111	1.3633																
0.90	1.4769	1.4878	1.5337																	
0.95	1.7006	1.7315																		
1.00	2.0000																			

NOTE: This table gives values of C_{ma} in formula $S_{ma} = 4\, C_{ma} R^2$, where S_{ma} equals area and R is radius of larger cylinder. For interpolation purposes $j = \frac{r}{R}$, where r equals radius of smaller cylinder, and e equals ratio of offset of cylinder axes to radius of large cylinder.

Table 2. Surface of large cylinder cut out by intersecting small cylinder.

J \ e	0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
0.05	3.1396	3.1357	3.1239	3.1040	3.0761	3.0397	2.9946	2.9405	2.8768	2.8028	2.7177	2.6206	2.5094	2.3829	2.2381	2.0718	1.8758	1.6412	1.3412	1.0174
0.10	3.1337	3.1297	3.1179	3.0979	3.0698	3.0331	2.9878	2.9336	2.8691	2.7945	2.7085	2.6102	2.4977	2.3693	2.2215	2.0498	1.8465	1.5949	1.2219	
0.15	3.1238	3.1198	3.1080	3.0877	3.0593	3.0223	2.9764	2.9218	2.8562	2.7804	2.6931	2.5928	2.4779	2.3457	2.1924	2.0119	1.7902	1.4693		
0.20	3.1099	3.1059	3.0937	3.0733	3.0444	3.0069	2.9603	2.9041	2.8378	2.7605	2.6710	2.5679	2.4488	2.3108	2.1481	1.9495	1.6944			
0.25	3.0919	3.0878	3.0754	3.0546	3.0252	2.9868	2.9392	2.8817	2.8137	2.7341	2.6417	2.5343	2.4093	2.2618	2.0911	1.8848				
0.30	3.0697	3.0655	3.0527	3.0315	3.0013	2.9570	2.9130	2.8539	2.7835	2.7009	2.6042	2.5408	2.4900	2.4119	1.9546					
0.35	3.0431	3.0387	3.0257	3.0037	2.9727	2.9327	2.8814	2.8199	2.7466	2.6597	2.5579	2.4396	2.2839	2.0674						
0.40	3.0119	3.0076	2.9939	2.9718	2.9390	2.8968	2.8439	2.7795	2.7019	2.6098	2.4977	2.3587	2.1595							
0.45	2.9759	2.9713	2.9572	2.9335	2.8998	2.8557	2.7999	2.7315	2.6489	2.5490	2.4218	2.2551								
0.50	2.9349	2.9300	2.9153	2.8903	2.8548	2.8077	2.7485	2.6746	2.5834	2.4673	2.2956									
0.55	2.8885	2.8833	2.8677	2.8413	2.8033	2.7528	2.6881	2.6064	2.5009	2.3419										
0.60	2.8362	2.8306	2.8138	2.7853	2.7442	2.6890	2.6167	2.5214	2.3746											
0.65	2.7774	2.7714	2.7533	2.7218	2.6763	2.6139	2.5297	2.3938												
0.70	2.7113	2.7048	2.6844	2.6493	2.5971	2.5226	2.3993													
0.75	2.6370	2.6293	2.6061	2.5653	2.5018	2.3985														
0.80	2.5527	2.5438	2.5159	2.4648	2.3663															
0.85	2.4562	2.4450	2.4086	2.3245																
0.90	2.3435	2.3271	2.2611																	
0.95	2.2055	2.1678																		
1.00	2.0000																			

NOTE: This table supplies values for C_{mi} in formula $S_{mi} = 4 C_{mi} rR$, where S_{mi} equals area cut out of smaller cylinder, r and R equal radii of smaller and larger cylinders, respectively. For finding C_{mi} let j equal $\frac{r}{R}$, and e equal ratio of offset of cylinder axes to radius of large cylinder.

Table 3. Surface of small cylinder cut out by intersecting large cylinder.

$2E$ and E is function of j instead of k. Lastly when R equals r, $S_{ms} = 8R^2 = S_{ma}$.

With the two cylinders intersecting with angle B less than 90 deg. the condition is similar to the case of the common volume of intersecting cylinders. Here the surface of one cut out by the other is equal to the surface cut out in the case of a right-angle intersection divided by the sine of the angle of intersection.

To make for rapid calculation of the surface areas Tables II and III were constructed in a similar manner to Table I. In order to use Table II for determination of the surface of the large cylinder cut out by the smaller one, determine the factor for the appropriate value of j and e and multiply by $4R^2$. Similarly, in order to apply Table III for the determination of the surface of the smaller cylinder cut out by the larger one, multiply appropriate factor by $4Rr$.

As an example, compute the external surface of the main line in the casting of Fig. 4 cut out by the branch, manhole and blowoff. Use the values of j and e used above for calculating the exterior volumes and determine C_{ma} from Table II. Results of such work follows.

	j	e	C_{ma}
Branch ...	0.7596	0	0.9938
Manhole ..	0.4327	0	0.3025
Blowoff ...	0.2644	0.6923	0.1706
Total ...			1.4669

Substituting in the formulas $S_{ma} = 4C_{ma} R^2$ the external surface is $4 (1.4669) (26)^2$ or 3,966.5 sq.in.

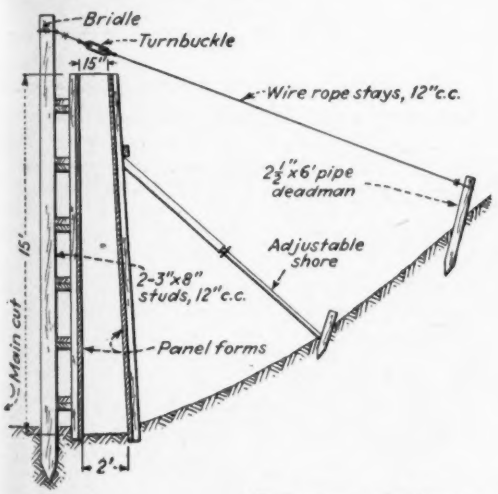
Wire Rope on Construction Job Aids Shoring and Bracing

Discarded pieces of wire rope have been used occasionally, usually in haphazard fashion, as ties and anchors on construction jobs. One of the contractors on the grade-crossing elimination on the C. & N. W. and C. N. S. & M. railroads at Winnetka, Ill., Robert R. Anderson Co. of Chicago, went a step further and designed form bracing and bank shoring, utilizing old wire rope as part of the design.

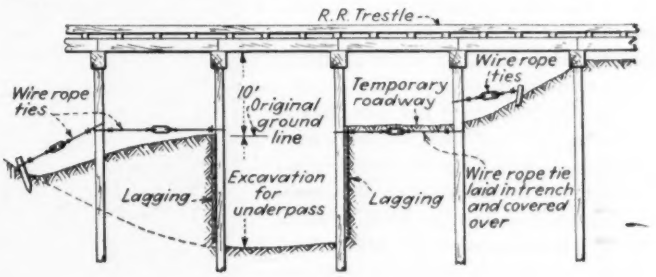
Anderson uses preformed wire rope on his equipment, and the discarded pieces of this type of cable are found to be ideal for making up ties and anchors. First, the ends do not explode or ravel when cut, making seizing unnecessary; second, the flexibility of preformed cable makes it easy to wrap cable around wales, piles and anchors; and third, broken wires lay close to the rope, so workmen handling the ties are not endangered by barbs and slivers. Thus, the wire is not only very useful, but has the advantage of easy installation.

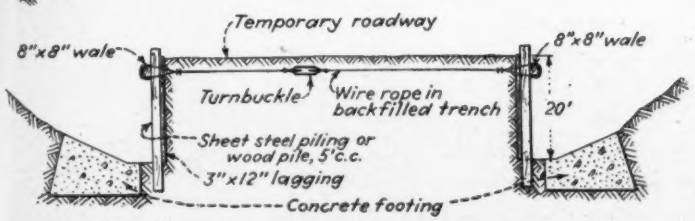
Four examples of the use of wire rope for shoring and bracing on this one job are given in the accompanying sketches. The drawings, with their captions, are self explanatory.

Retaining wall form braced with adjustable shores and wire-rope stays, where necessary, to keep form bracing out of main cut.

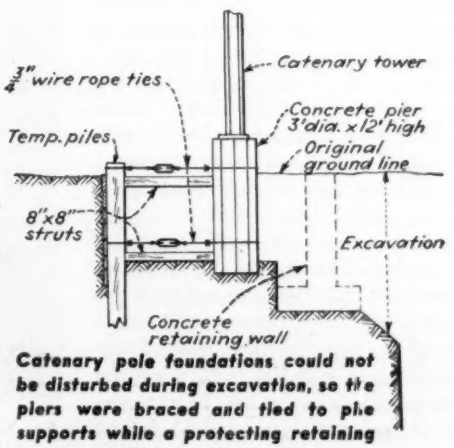


Lagging fastened to piles of temporary trestle bents, which were tied by cable slings and turnbuckles, kept fill in place for temporary roadways.





To maintain a roadway beneath an overhead bridge under construction and still clear the foundations, two lines of shoring were tied together by rope slings to retain center fill.



Catenary pole foundations could not be disturbed during excavation, so the piers were braced and tied to the supports while a protecting retaining wall was built.

Warehouse Designed to Speed Construction

***Contents in Brief**—Proposed methods of construction dictated the design for a concrete frame warehouse at a military establishment in the Middle West, and the net result was rapid enclosure of 18 acres of storage space. Bays are 22x40 ft. with a flat slab concrete roof on which rain-water will be impounded until it evaporates, thus eliminating the need for disposal pumps. A single monitor bay accommodates shop cranes over two railway tracks running the full length of the building. Columns were built with circular steel forms and roof slabs were formed on traveling timber carriages.*

SEVERAL unusual design features were adopted to reduce the cost and to speed construction of a 540x1,400-ft. storage warehouse at one of the important military establishments in a mid-western state. For example, rainwater will be impounded on the roof until it evaporates. Also, the floor was allowed to slope to reduce the earthmoving required, but the roof is level. Other economies resulted from the fact that the building was designed to expedite the use of traveler forms for roof and monitor construction and that in general, construction practices were simplified by forethought on the part of the designers. As a result it is estimated that $400,000 was saved over a structure of similar storage volume built elsewhere.

For the most part the structure is to be used for unheated storage of a variety of materials which have no known or definite space demands. This permitted design of the building to be made on a strict utility and economy basis, resulting in the use of bays 22 ft. 4 in. x 40 ft. with 18-in. dia. columns resting on spread footings on clay soil and supporting a 6-in. thick concrete roof slab, which rests on 15 x 40-in. beams running the long way of the building. Over a 52-ft. wide monitor section the slab is only 3½ in. thick but is supported by inverted or overhead beams.

The roof is designed for 45 lb. per sq. ft. live load and will pond 2½ in. of water. The ground elevation at the site is such that natural drainage is slow or non-existent and, to avoid pumping the water from this 18-acre area, it is planned to hold it on the roof until it evaporates. It is recognized that the 2½-in. height is not sufficient to hold the water from unusually heavy or successive rains, but it will hold most of the normal precipitation and the rest will be permitted to spill over the edges. The 6-in. slab is covered with a 5-ply, built-up roof topped with gravel and guaranteed for a life of 20 years. The plan to pond water on the roof did not materially change the design or increase the cost of the covering.

Around the exterior edges of the building, and at the open expansion joints, 3 x 8-in. creosoted timber planks are fastened to the concrete by bolts set when the roof slab was poured. Over the joints inverted "V" metal strips are placed to permit expansion. The built-up roof is then constructed with the roofing material carried over the joints and lapper over the timber around the exterior edge of the building. This holds the water in small ponds, making it unnecessary that the entire 18-acre roof be exactly level and preventing a deluge if the roof should be punctured.

Columns, beams and slabs are reinforced with a minimum amount of

Fig. 1. A traveling bridge rides on the permanent crane rails to carry the forms for the monitor roof section of a huge warehouse.

steel, all of it straight bars except a few stirrups in the beams and some spacer steel in the columns. Bars are nearly all base price sizes and were purchased in stock lengths and detailed for cutting into the necessary lengths without waste. Exterior walls are of 8 in. precast concrete blocks with 4-in. pilaster stiffening used at the third points of the 40-ft. spans. The walls do not carry any of the roof load, the concrete frame being made complete to expedite construction.

A double-track standard gage railroad passes down the center of the structure at a depressed grade so that car-door is level with the warehouse floor. Two overhead cranes, with a 49-ft. 8-in. span, travel the full length of the building in a monitor roof section. The sides of the monitor are of glass block, and are the only points where natural light is admitted to the building. Ventilation is provided by sheet metal ventilators on the monitor roof.

Counterweighted, upward sliding doors, 14 ft. high and 16 ft. wide, are provided at 120-ft. intervals along each side of the structure. The permanently installed lighting is only one row of small lights in each third 40-ft. bay in line with the door openings. Powerful portable lights are expected to be used in any areas where work is being done, electrical outlets being provided frequently for this purpose.

The building is too wide to depend simply on long lengths of hose for fire protection, therefore water mains are laid under the floor at the quarter points of the width and hydrants have been provided at frequent intervals. A small administration space, toilets and lockers are located in one corner of the building.

Construction plan

The designers considered the probable construction methods of the contractors who would be interested in the project and designed the structure to speed the building operations. This plan anticipated concentrating on the footing along one side of the structure and continuing along successive parallel lines so that paving in the longitudinal 22-ft. 4-in. bays could follow immediately with standard highway equipment and machine finishers. It was assumed that travelers rolling on the concrete floor would be used to carry the forms for the columns and the roof slab. To fit this plan the bays were designed to permit rolling the travelers the full 1,400-ft. length of the building without dismantling and without having to be lowered more than an inch or so for moving clearance. The roof of the monitor was designed with inverted beams to accommodate a form traveler, moving the full length of the building on the crane rails.

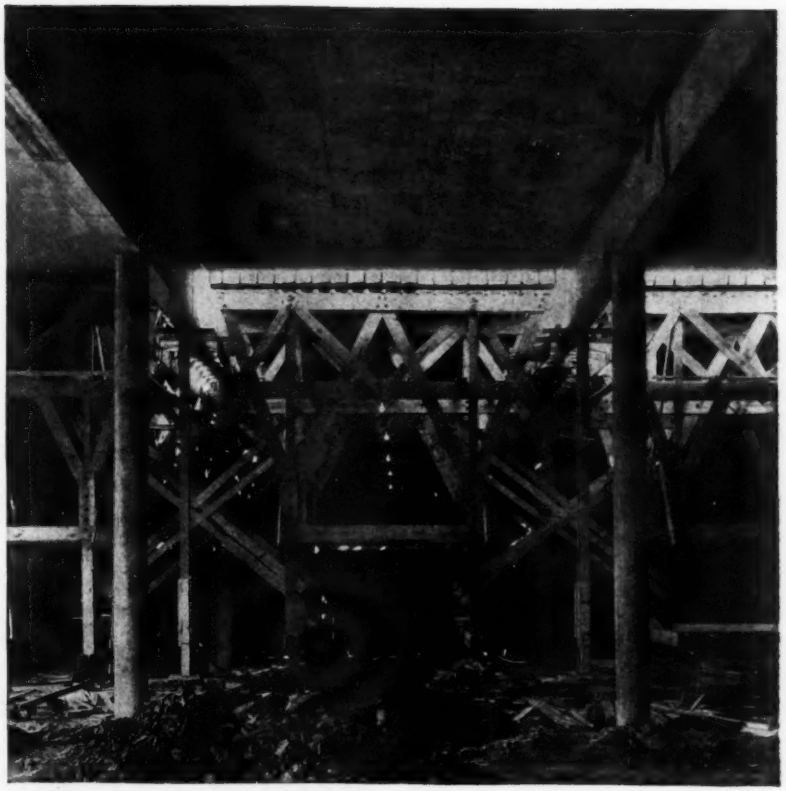


Fig. 2. A 300-ft. traveler was set in each of the 22 bays of the building and was pushed ahead manually in 100-ft. sections on rails as concreting progressed.

The contractor to whom the work was awarded elected to speed the enclosure, placing all of the column footings and completing the concrete columns before the roof slab was started. The floor was placed inside the building after it was enclosed.

First in the contractors' plan was preparation of a plant to prepare concrete required in the building. Since the concrete necessarily would be spread over the entire 18 acres covered by the building a mobile method of distribution was selected, a fleet of 3-yd. high discharge truck-mounted mixers being purchased to mix as they hauled to point of placing.

Concrete aggregates were trucked to a stockpile at the site and a crawler crane and clamshell bucket were used to charge a portable type batcher bin. Steam jets discharging into the bin and in the water supply furnished sufficient heat to produce concrete at 80 deg. F. or more. The coarse aggregate was crushed stone with a maximum size of $\frac{3}{4}$-in. used with a natural sand. The cement used was finely ground, most of it passing a 325 mesh sieve and having a surface area ratio of over 1,800. Specifications required a minimum of six bags of cement, and called for a 3,500 lb. concrete. The rich mix and finely ground cement, supplemented by adequate heating, produced a concrete with rapid setting and high early strength characteristics. This assisted the contractor materially as he was permitted to strip beam and slab forms (at his own discretion and responsibility) after the concrete attained a compressive strength of 2,500 psi. and a modulus of elasticity of 2,000,000 psi.

Rains on the low-lying site made it difficult to operate in the clay soil of the area, and this delayed construction appreciably. Footings, carried to just below the frost line and

stepped in once, were excavated by crane. Little earthmoving was required as the site is nearly flat and the building floor is sloped to conform to the general slope of the land with column heights varied to maintain the roof level. Although column forms were furnished and erected under a subcontract, the general contractor poured the concrete. For this purpose he used a crawler crane and bucket.

Three 100-ft. sections of traveler and forms for the main roof slab were provided for each of the twenty-two 22-ft. 4-in. bays in the full width of the building. This was sufficient to complete the structure in five moves of the forms. The carriers traveled on rails blocked up from mud sills laid on the ground, the 100-ft. sections being advanced 300 ft. at a time by pushing them manually. The section furthest ahead was the first one to be prepared and concreted so that stripping could be done first to permit moving the lead sections and repeating the cycle without waiting for the concrete to gain strength. Cross members under the concrete beam, supported on the two adjacent travelers, were removed and the beam sides stripped, thus releasing the section of form so it could be lowered a few inches until the traveler wheels rested on the rail. The individual sections, 21 x 100 ft., then were ready to be pushed ahead. When in the new position the forms were raised to grade, by screw jacks set on the traveler rail, and then reassembled. The 15 x 40-in. longitudinal beams were formed and placed integrally with the roof slab. The plywood decking for the slab form was left in place on the traveler except at the connections between sections.

Concrete placing was started from one corner of the most advanced section of forms. A longitudinal expansion joint, in the center of a bay, divided the eleven bays on each side of the monitor into two sections and, with transverse joints at 100-ft. intervals, formed a convenient size-placing area of 100 x 120 ft. Concrete for the roof slab was hoisted by crane to a hopper used to fill carts for distribution to point of placing, where flexible-shaft gasoline-powered vibrators consolidated the concrete dumped on the roof. Successive roof blocks were poured, working back 300 ft. to the previously placed concrete, so

Fig. 3. Concrete came to the work in transit-mix trucks and was hoisted to the roof in this low-loading height bucket. Distribution was handled by big-wheel concrete carts.

Fig. 4. Truck-mixers were loaded at this portable batching plant.

that by the time the entire form had been covered the first section had gained sufficient strength to permit stripping.

The monitor section was formed on a traveling bridge 200 ft. long, which spanned the 49-ft. 8-in. opening, and was designed to carry the load of concrete and placing equipment. This traveler was made of timber trusses, rolled easily on double-flange wheels on the permanent crane rails and, when in position, was raised to grade on built-in screw jacks. The truss design was complicated by the necessity of providing a deeper truss than could be built above the traveler wheels so the design was "underslung" as may be seen in Fig. 1. The trusses were at 10-ft. centers and carried 2 x 8-in. timbers at 12-in. c.c. on which ⅝-in. plywood decking was nailed. Concrete distribution here was also by carts, operated over the tops of the inverted concrete beams. The concrete of the monitor roof was placed in full width, 100-ft. long sections, and the traveler moved ahead 200 ft. at a time.

Tarpaulins, salamanders and straw

During cold weather the area where concreting was underway was enclosed by tarpulins and heated by coke-burning salamanders hung from the form travelers. After the roof slab concrete was placed it was covered with burlap and then with a foot of straw. Having the concrete warm when placed gave the chemical action of the cement a rapid start so that it was necessary to protect the concrete from freezing for only a short period.

The 6-in. thick floor slab was laid after the building was partially enclosed. Fine grading was done by motorized patrol graders; street paving forms were set on the line of the column centers; and concrete placed in 22-ft. 4-in. wide lanes of any convenient length. Bituminous expansion joint material was used on the column lines both transversely and longitudinally. Wire mesh reinforcing was placed 2 in. below the top of the slab.

Concrete was delivered by the 3-yd. truck mixers, the high discharge feature of the mixers making it possible to chute to the center of the 22-ft. width from a position outside the lane being placed. The building columns prevented the use of finegraders, finishers or other heavy paving equipment supported by the forms.

Concrete was spread manually and then leveled by a timber screed which spanned the full width of the lane and rested on the forms. The screed was equipped with plow handles at each end and was rocked back and forth while being pulled ahead by a hand-operated, geared winch. One screed made a single pass to level a lower course for the mesh reinforcing and a second screed was used for the top, making two or more passes as required to smooth the surface. A long-handled wood float was used for supplementary finishing and wet burlap dragged over the surface to produce the final finish. Burlap and straw were spread over the surface to prevent freezing or rapid drying.

For protection of our country's interests, identification of the site and the personnel of the work must await the successful conclusion of the war.

Fig. 1. Double-web plate girders of plywood impart an unusual appearance to this wartime building.

Plywood Girders Roof a Warehouse

***Contents in Brief**—A total of 198 identical timber girders of unique design are used to support the roof of a new building for the RCA Manufacturing Co. at Camden, N. J. Two webs of 5/8-in. plywood and laminated chords of 2x6-in. planks are the principal girder elements. The chords are assembled by tooth-ring connectors and the webs are fastened to the chords by cement-coated nails. Stiffeners are placed between the webs. Special fabricating technique turned out the girders rapidly and efficiently.*

THE RETURN TO TIMBER construction by American builders and designers in recent months has resulted in considerable "pioneering" in one of the oldest known structural materials. For example, what is believed to be an innovation in timber construction was embodied in a warehouse recently erected for the RCA Manufacturing Co., at Camden, N. J., by The H. K. Ferguson Co., industrial engineers and builders of Cleveland and New York. Consisting of 36-ft. span double-web girders of plywood, this particular innovation is credited with being largely responsible for delivery of building at low cost in record time.

The RCA warehouse contains 125,000 sq.ft. of floor space, and uses a total of 198 of the plywood girders, all alike and all fabricated on the job site. The girders consist of 5/8-in. plywood webs inclosing laminated chords of 2x6-in. planks and vertical stiffeners varying in size from 6x10's to 2x6's. The stiffeners also serve as splicing members for the plywood sections. At the ends of each girder a vertical 6x6 extends above and below the chords, affording a means to bolt the girders to the columns. Split-ring connectors are used in conjunction with these bolts. The girder chords, which increase in section from the ends toward the center, are assembled with 5/8-in. bolts and tooth-ring connectors. A total of 45 bolts varying in length from 4½ to 9½ in. was required for each girder. Fastening of the webs to the chords and stiffeners is through cement-coated nails driven in a pattern similar to the rivet spacing patterns used on steel plate girders. The cement-coated nails were selected because barbed nails were not available, and experience proved that their holding power greatly exceeded that of ordinary nails.

The girders were designed to provide economy in both materials and labor, and results proved them to be successful in both respects. The 36-ft. span is divided into nine 4-ft. sections, and each web splice is 2 in. longer than the previous splice, making the depth of the girder on one end 3 ft. 3 in., and on the other 4 ft. 9 in., a difference of 18 in., which provides a roof slope of about 4 percent for drainage purposes.

The 5/8-in. plywood was purchased in 4x8-ft. stock sheets, which meant that the web material could be cut for each of the nine sections without wastage. For example, sections 1 and 9 could be cut from the same 4x8-ft. sheet because the first section was

3 ft. 3 in. at the vertical, and the ninth section was 4 ft. 9 in. Likewise, sections 2 and 8 could be cut from a similar 4x8-ft. sheet because section 2 was 3 ft. 5 in. at the vertical, while section 8 was 4 ft. 7 in. The same principle was applied to the remaining sections; and to eliminate lost time from measuring, templets were used to make the operation an almost mechanical one.

Fabricating the girders

Production of the girders on the site averaged 18 girders per 8-hr. day. To achieve this production, approximately 60 carpenters and 15 laborers were necessary. Chord and stiffener members were cut from dimension timber of standard lengths after they came to the job site.

Nailing of the sheathing to the stiffeners and to the chords proved to be one of the most interesting of the problems that had to be solved. It was imperative that extreme care be exercised in this operation because of the large number of 8*d* coated nails necessary to transfer the shearing stresses across the web splices and from the chords into the webs. The nails had to be spaced far enough apart to keep from splitting the laminated 2x6 chord members. Also, there was the possibility of splitting the ends of the narrower vertical stiffeners.

In order to get accurate nailing, the engineers prepared a drawing showing the spacing of the nails. It was suggested to the field construction men that they cut a piece of sheet metal the exact size of each web section and that small holes be punched as directed by the drawing. This done, the metal templet holes were placed over the plywood sheet and a stencil made, marking accurately the location of each nail to be driven. There are some 3,400 nails in each girder, a total of 650,000 for the 198 girders in the 6-bay building.

Fig. 2. Girders, whose nailing pattern resembles rivets, are fastened to column through bolts and split-ring shear connectors.

Local building authorities required a full scale load test to be made on one of the girders before approving the design. A test girder, consequently, was set in place on 8x8-in. columns over two interior footings and loaded at the five purlin points with a 40 percent overload of 35,122 lb. total, or 7,025 lb. at each purlin point. Deflection in inches at various stages in the test were as follows:

Weight of truss only	1/8
Load of 2,745 lb.	3/16
Load of 16,665 lb.	11/16
Load of 24,562 lb.	1 1/16
Load of 35,122 lb.	1 3/8
Load removed	5/8

Because of the smooth-surfaced plywood covering, these girders, it is believed, will catch a minimum amount of dust. Also, they may be removed very easily and used in another building if the original structure should prove to be temporary. These advantages, plus rapid and economical construction with materials that are available, amply justified the use of these unusual girders in this new building.

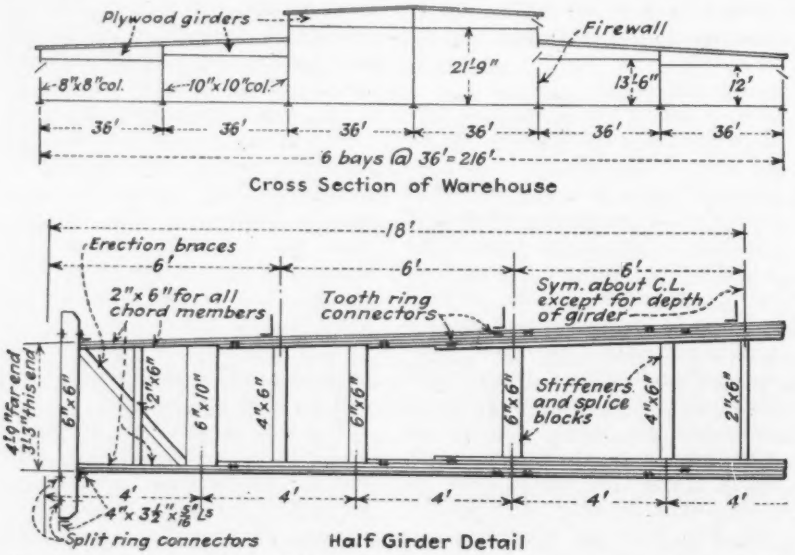


Fig. 3. Detail of plywood girder and cross-section of warehouse in which 198 such girders are used.

Concrete Ties on An English Railway

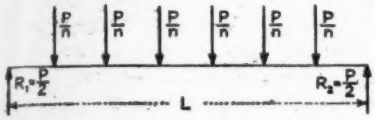
To reduce the consumption of timber in England under war conditions, the Great Western Ry. is making concrete ties of the "pot" type, each consisting of a pair of blocks connected by a 2½-in. angle as a tiebar. This type was adopted on account of the great weight of full-length concrete ties. As described in *Railway Gazette* (London) of Nov. 14, the blocks are 24½ x 18½ in., with chamfered edges and corners; the 5¼-in. thickness is reduced to 3¾ in. at the middle by a circular cavity on the under-side. Cast-iron chairs for the double-head rails have a ¾-in. wood cushion under them and are secured to the block by two through bolts having the nuts on top. The tiebars have holes to fit these bolts. A concrete mix of 1: 1½: 3 is made with granite chips and quick-hardening cement, and density is insured by the use of mechanical vibrators. A minimum of 28 days is allowed for curing. Including the rail chair and 5¾ lb. of reinforcing bars, the weight of each block is 246 lb. The manufacturing plant has a capacity of 150,000 blocks annually.

From Field and Office

Working problems and time-saving methods for engineers and contractors

New Moment Formulas

The case of equal concentrated loads equally spaced on a simple beam occurs often in practice. In the absence in the literature of a simple formula, calculation or the bending



moment may be a long operation. To save time the writer has devised formulas as follows:

Referring to the sketch, let P = total load and n = number of equal loads. When n is odd then

$$M_{max} = \left(\frac{n+1}{n}\right)\frac{PL}{8} \quad \ldots\ldots(1)$$

When n is even, then

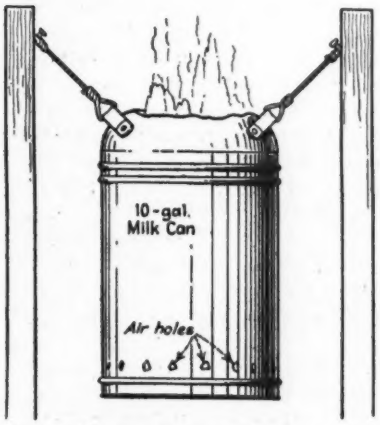
$$M_{max} = \left(\frac{n+2}{n+1}\right)\frac{PL}{8} \quad \ldots\ldots(2)$$

n	M max	Decimalst.
1	1/4 PL	.250
2 or 3	1/6 PL	.167
4 or 5	3/20 PL	.150
6 or 7	1/7 PL	.143
8 or 9	5/36 PL	.139
10 or 11	3/22 PL	.136
12 or 13	7/52 PL	.134
14 or 15	2/15 PL	.133
16 or 17	9/68 PL	.132
18 or 19	5/38 PL	.131
20 or 21	11/84 PL	.131
22 or 23	3/23 PL	.130
∞	1/8 PL	.125

It is interesting to observe that M_{max} is the same for $n = 2$ and $n = 3$, for $n = 4$ and $n = 5$, etc. The accompanying table illustrates the formula. — JOSHUA TABATCHNIK, architect, Brooklyn, N. Y.

Hanging Salamander Warms Exposed Pump Station

In a cold, rocky gorge where the winter sun shines for only an hour or two at noon, a grout pump operator is stationed in exposed locations, controlling the flow of grout into Shasta Dam foundation. Numerous pipe connections, the need for unobstructed view and frequent moves make it impractical to provide housing for the operator. However, he is able to make his station relatively comfortable with an old 10-gal. milk can made into a salamander and hung close to the pump control platform.



How a 10-gal. can is made into a valuable heating plant.

The top was cut out of the can just above the handles and rough holes were punched near the bottom, apparently by blows of a pick. Two pieces of wire support the salamander in the spot found most effective.

Ladder of Durable Design For Access to Tank Roof

For ladders that give access to the flat tops of circular concrete reservoirs, of which the East Bay Municipal Utility District, at Oakland, Calif., has an even dozen, a standard design has been adopted to obtain a durable, neat-appearing ladder with a low maintenance cost. It consists of 2x2-in. angles, bedded in the concrete foundation at the bottom and welded to structural steel members at the top. The rungs are made of ¾-in. steel reinforcing bars, which are passed through holes burned in the steel angles and then welded in place. The bar corrugations prevent the rungs from getting slippery.

This steel ladder, with rungs of reinforcing bars, is set a few inches away from the outer wall of a circular water storage tank.

Cable Scraper Quickly Loads Hopper in Gravel Pit

When the Board of Revenue, Dist. 1, Shelby County, Ala., was confronted with the problem of a breakdown of its power shovel, a 6-yd. cable scraper was used successfully for moving gravel from a pit. This saved much time, since repairs for the shovel were expected to cause a 78-day delay, and hand loading was seen as too expensive.

In order to make this loading job feasible, a 14-ft. deep ditch was cut in the middle of the pit, a bridge of 8x10-in. timber built over the trench, and a 3-ft. square hopper installed at the bridge's center so that the gravel would go into the truck without too much waste. During loading operations the scraper picked up a load of gravel, moved onto the bridge and stopped directly over the hopper in the unloading position. The trucks moved along in the trench and stopped under the hopper to get their loads. Once loaded they continued along the trench and out on the road to the dump.

Heil Co. photo

The loading trap, which cost only $21 to construct, functioned so efficiently that more than 25 trucks were able to be loaded before removal of the waste from the trench was necessary. When this was required it was only a two-minute job and the waste load was dumped through the hopper into a waiting truck. The loading trap operation with the scraper permitted the hauling of some 4,800 cu.yd. of gravel in 11½ days.

Elevations on Vertical Curves

The calculation of elevations on parabolic vertical curves, including the high or the low point, is simplified by the following formulas. Referring to the accompanying diagram let:

G_1 = percent of tangent grade next to the P.V.C.
G_2 = percent of tangent grade next to the P.V.T.
L = horizontal length of the vertical curve in stations.
X = horizontal distance from the P.V.C. to any point on the curve in stations.
a = a constant depending on the tangent grades and curve length.
a = algebraic difference of tangent grades divided by $2L$, or

$$a = \frac{G_1 - (-G_2)}{2L} \qquad (1)$$

Let E equal the elevation at P.V.C., Y equal the distance above or below E, and P_1, P_2 and P_3 be given points on the curve. The curve equation is $G_1X - aX^2$. The slope of the tangent at any point on a curve is the derivative of the equation of the curve.

$$\frac{dy}{dx} = G_1 - 2ax \qquad (2)$$

$$\text{Then } y = \frac{x}{2} G_1 + \frac{x}{2} (G_1 - 2ax) =$$

$$\frac{x}{2} (2G_1 - 2ax) = x(G_1 - ax) \qquad (3)$$

The elevation of any point on the curve is given by the equation

$$E + x(G_1 - ax) \qquad (4)$$

Substituting in Equation 4 the values given in the accompanying diagram, the elevations at P_1, P_2 and P_3 are as follows:

$$a = \frac{4 - (-6)}{2 \times 4} = 1.25$$

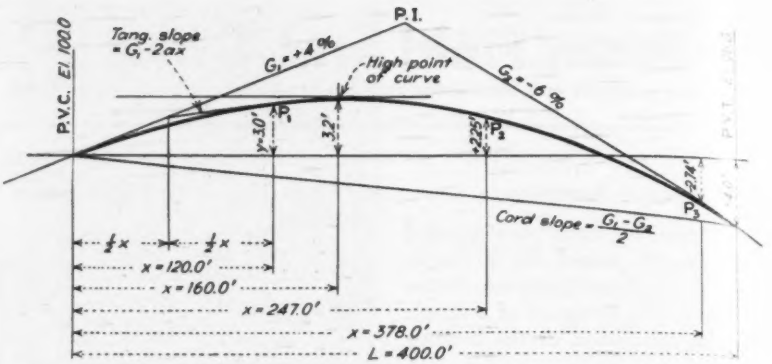
$P_1 = 100 + 1.20 (4 - 1.25 \times 1.20) = 103.00$ ft.
$P_2 = 100 + 2.47 (4 - 1.25 \times 2.47) = 102.25$ ft.
$P_3 = 100 + 3.78 (4 - 1.25 \times 3.78) = 97.26$ ft.
High point $= 100 + 1.60 (4 - 1.25 \times 1.60) = 103.2$ ft.
Elevation at P.V.T. $= 100 + 4 (4 - 1.25 \times 4) = 96$ ft.

The slope of the chord is equal to the algebraic sum of the tangent grades divided by two or

$$\frac{-G_1 + (-G_2)}{2} \qquad (5)$$

The elevation at the P.V.T. equals

$$E - L\frac{-G_1 + (-G_2)}{2} \qquad (6)$$



Vertical curve for which elevation of high point is to be determined, as well as elevations at different points.

The elevation of the curve will reach a maximum or minimum when the derivative of the equation of the curve equals zero. Then the distance from the P.V.C. to the high or low point is given by the equation $G_1 - 2ax = O$, then

$$x = \frac{G_1}{2a} \text{ in stations} \qquad (7)$$

Substituting values,

$$X = \left[\frac{4}{(2)(1.25)}\right] 100 = 160 \text{ ft.}$$

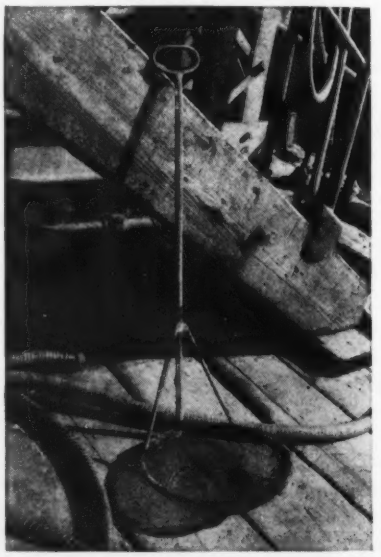
E. A. HINDMAN,
Ypsilanti, Mich.

Handy Foot-Valve Strainer For Construction Pumps

Where the water on a construction job must be pumped from a sluggish stream or body of still water exposed to blown trash and leaves, frequent cleaning of the foot-valve strainer is necessary to prevent choking of the suction line and consequent loss of water to the pump. Loss of the pump's prime, when raising the foot valve out of the water for cleaning the strainer, coupled with the fact that the line was so heavy as to require calling in extra help for the job, led a Texas contractor to devise the supplemental strainer illustrated in the accompanying picture. The strainer is under the grille forming a portion of the foot-valve casting. The strainer consists of a reinforced handle, terminating at the lower end in a loop covered with a good grade of hardware cloth shaped to the contour of the foot valve.

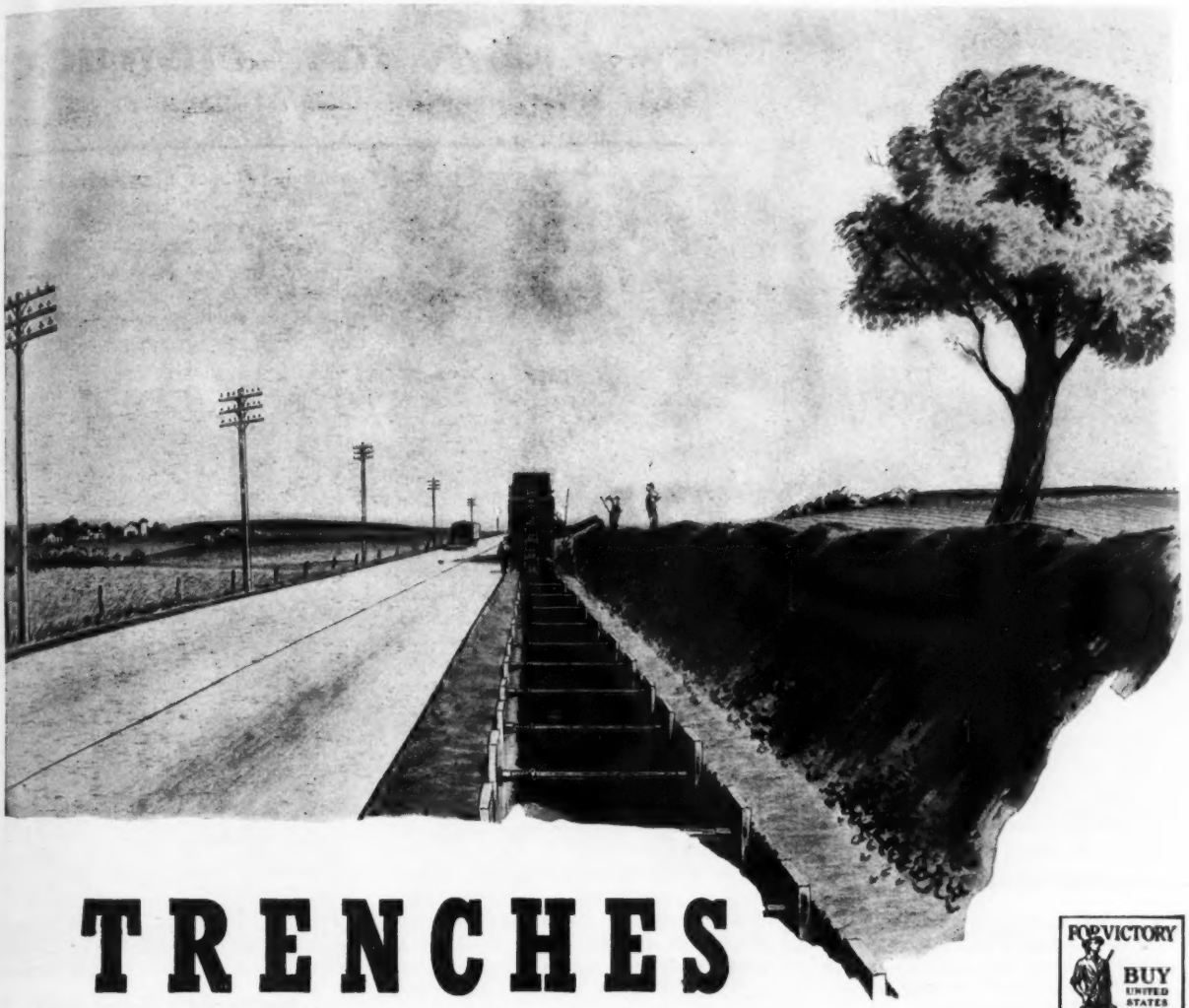
The upper end of the handle, with a wide eye welded in it, is slipped over a pin welded at the proper spot in the suction line to hold the strainer closely against the grille. Leaves, trash and other unwanted materials in the water are carried against the screen and matted to it by the suction of the pump.

Whenever the pump's performance or dropping pressure indicates clogging, the strainer's handle is slipped off its supporting pin, and the strainer quickly cleaned and replaced before sufficient trash enters the pump to cause trouble. For extremely trashy locations two strainers are used, one being slipped on as the fouled one is removed for cleaning purposes.



Inexpensive strainer for foot valve of water pump saves money on a Texas construction job.

Greatly extended pump life pays for the strainer many times over on the strainer's cost, and such strainers are now regular equipment for this contractor.—CHARLES C. LYNDE, *P. O. Box 1129, Houston, Texas.*



TRENCHES

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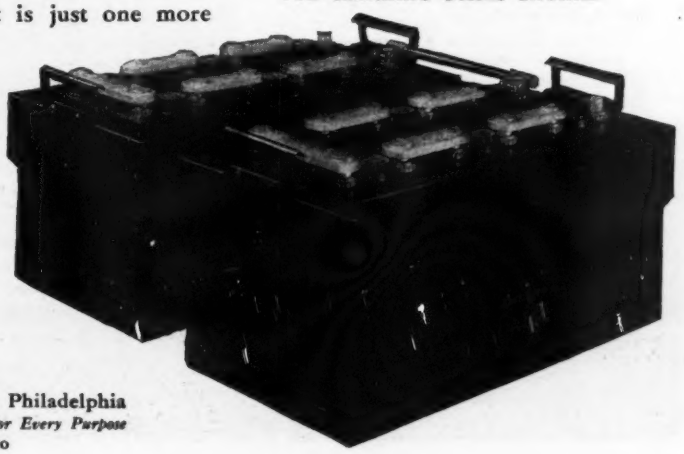

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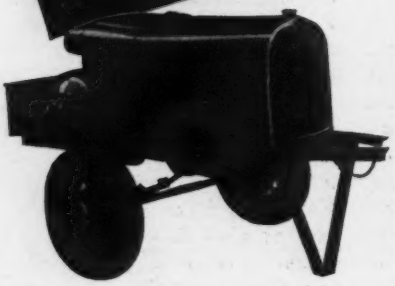

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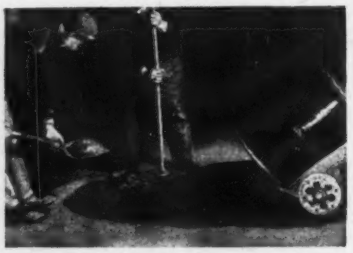
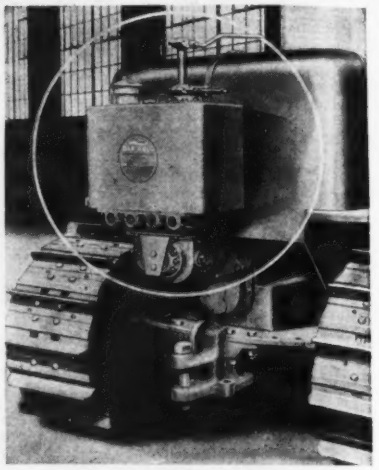


Flooring

A type of flooring which permits touching or overlaying a rutted floor without delaying traffic has been developed by the Flexrock Co. A new ready-to-use material called "Instant-Use Resurfacer" is the answer to repair problems in plants maintaining full time production. The product adheres to old concrete or wood flooring.—*Flexrock Co., 23rd and Manning Sts., Philadelphia, Pa.*

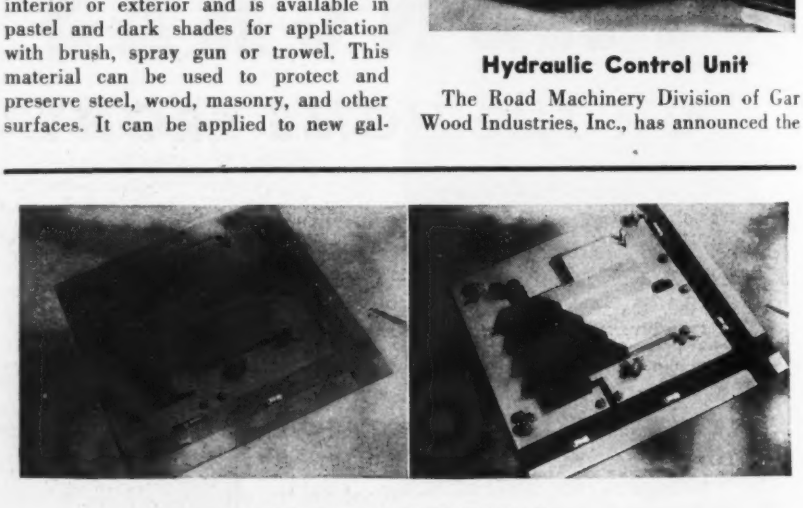
Plastic Coatings

Wet-X-Hale builders plastic is an oil-base portland cement product, combined with various indestructible fine aggregates, so ratioed and processed to become a smooth working plastic medium, producing a firm, tough, yet flexible finish. It can be applied either interior or exterior and is available in pastel and dark shades for application with brush, spray gun or trowel. This material can be used to protect and preserve steel, wood, masonry, and other surfaces. It can be applied to new galvanizing without neutralizing the zinc plating and to new steel without degreasing. A special feature of the material is that it is suitable for use directly on rust if flakes are removed. This plastic material is said to be suitable for coating all kinds of structures and is especially valuable in contact with salt or acid. It is non-peeling, and non-cracking, a light metal coated with this plastic being capable of repeated bending without failure of the coating material.—*Rogear Company, 11 Water St., New York, N. Y.*



Hydraulic Control Unit

The Road Machinery Division of Gar Wood Industries, Inc., has announced the



Camouflage Paint Effects

The effect of the use of infra-red reflecting paint to conceal structures from the eyes of the infra-red camera used to a great extent by military observation planes, is shown in the two photographs above. The photo at left shows a model as seen by the naked eye, with half of the structure covered with ordinary paint, and the other half with a newly developed "L-Series" produced by the Premier Oil & Lead Works. At right is the same model photographed with a camera equipped with an infra-red filter, showing how "L-Series" shows up white and reduces its visibility, while ordinary paint shows black to heighten its visibility.—*Premier Oil & Lead Works, Los Angeles, Cal.*

production of a new-type hydraulic control unit for operating heavy-duty dirt-moving machinery drawn by industrial track-type tractors. Power for the unit is taken from the tractor motor through a direct shaft connection.—*Gar Wood Industries, Inc., Detroit, Mich.*

Blackout Controls

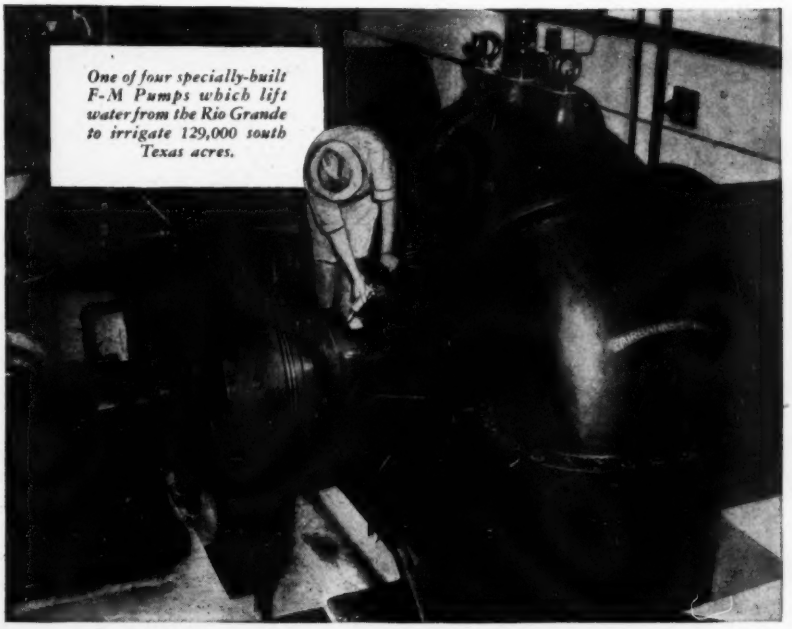
Controls actuated by photoelectric cells for automatic blacking out of signboards, store displays, and other lighted areas are offered by the Photoswitch, Incorporated. The blackout switches are located on the billboard or in the store windows or other places which are to be controlled, aligned with the nearest street lamp. When this centrally controlled lamp is turned out, the photoelectric cell in the switch automatically turns off illumination it controls. — *Photoswitch Incorporated, 21 Chestnut St., Cambridge, Mass.*

Armor Plate Welding

Three electrodes known as AW-1, AW-2, and AW-3, developed specifically for the welding of armored vehicles to Army Ordnance Department specifications AXS-492 and AXS-497, are now being manufactured by the Narnischfeger Corp., Milwaukee, Wis. Details of the new electrodes and their application pertaining to armor welding are restricted to prime and sub-contractors qualifying under Ordnance regulations, and are available only on application through Harnischfeger field representatives.—*The Harnischfeger Corp., Milwaukee, Wis.*

Portable Scraper Hauler

A compact, powerful scraper hauler, suitable for small jobs or in close workings, for handling ore in preliminary



One of four specially-built F-M Pumps which lift water from the Rio Grande to irrigate 129,000 south Texas acres.

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129,000 ACRES

ECONOMICALLY

● The great Willacy County Irrigation Project in Texas, one of the largest pumped irrigation projects in the world, relies on Fairbanks-Morse Pumps for economy and dependability.

In the main pumping station, four 54-inch F-M Propeller Volute Pumps, each powered by an F-M Diesel, lift an acre-foot of water an average of eight feet from river to canal with a fuel oil consumption of only 5.68 pounds! A re-lift station in the main canal uses four 42-inch F-M Angleflow Pumps with F-M Diesel drives. Several smaller re-lift stations in the branch canals use F-M Vertical Propeller Pumps. Some land not lying below the ditches is watered by sprinkling systems fed by portable F-M Pumping Units.

Diversified as were the Willacy requirements, there were ideal F-M Pumps for each need. But the F-M Pump line is far broader than this. It includes the right type and size of pump for *every* need, whether concerned with irrigation, with domestic or industrial water supply, or with sewage disposal. F-M Pump Engineers are at your service, without cost or obligation. Write Fairbanks, Morse & Co., Dept. D29, 600 S. Michigan Ave., Chicago. Branches and service stations throughout the United States and Canada.

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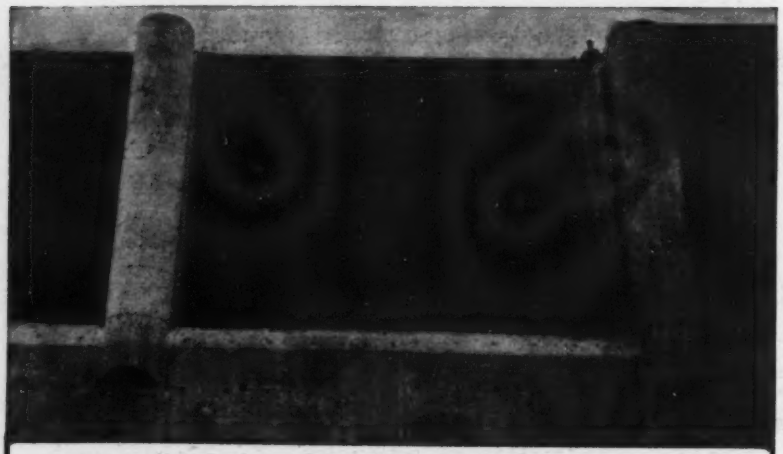

Reilly PROTECTIVE COATINGS . . .

On all types of engineering projects throughout the country, as in the dam gates pictured above, where metal surfaces are exposed to the corrosive influences of air, soil or water, Reilly Primer and Pipe Enamel, and other Reilly Protective Coatings are widely used.

For the protection of water mains, pipes and conduits, oil and gas pipe lines, Reilly Primer and Pipe Enamel offer a smooth, tough coating that is highly resistant to abrasion. This coating will safely withstand exposure through a wide range of temperature without cracking or sagging. Reilly Coal Tar Paints are quick-setting, and may be applied with spray or brush to protect structural steel, tanks, and exposed metal.

There is a Reilly Protective Coating which meets every requirement. Write for descriptive literature.

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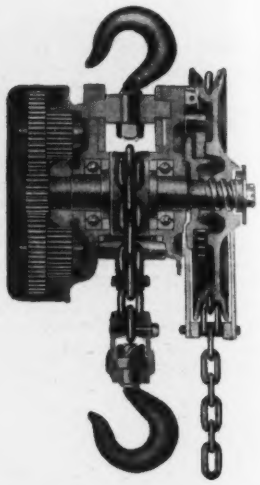
rounds or sub-level drifts, short clean-up jobs in isolated workings, mucking out short cross-cuts, handling waste fill and many similar jobs, has been recently developed. This hauler is 27 in. long and will pass through a 12x14-in. opening.—*Sullivan Machinery Co., Michigan City, Ind.*



Spur Geared Chain Hoist

An improved, standard type, spur geared chain hoist is now being manufactured by the Coffing Hoist Co. Recommended for many applications in all lines of industry where maximum speed, safety, durability and efficiency is essential, this hoist is equipped with a dust guard to protect the Weston type brake from dust and dirt. Heavy suspension plates provide unbreakable support between crosshead and load sheave. The plates also directly support the saddle for double-chain hookup, an entirely new feature in this type hoist, and eliminates the use of a top yoke, thus reducing weight and headroom and permitting hoist to hang evenly at all times.—*Coffing Hoist Co., Danville, Ill.*

Camouflage Paint

A well illustrated booklet which tells of the use of a newly developed paint, called "Infray," developed to meet the need of American war industries for paint which will make war plants less visible to the eyes of possible attackers, has been issued by the Arco Co. The new paint is infra-red reflecting, heat reflecting, and has been developed after long study in the fields of paint pigments and infra-red photography.—*The Arco Co., Cleveland, Ohio.*

Reproductions

For making clear, clean original copies of bluepints, letters, drawings and other original matter, a group of "Trucopyphote" reproducing machines have been developed and are offered by the Photo

Reproducing Equipment Co. Many of the models are portable, and all can operate without a darkroom.—*The Photo Reproducing Equipment Co., Chatham, N. J.*

Safety Inner Sole

A new safety inner sole has just been developed by the Goodall Rubber Co., Inc., of which a sample, when dissected reveals a flexible steel sheet between two layers of high grade leather.

It is claimed that the safety inner sole will reduce compensation rates by eliminating foot injuries due to nail punctures. Sold in pairs in sizes to fit all boots and shoes.—*Goodall Rubber Co., Inc., 9 So. 36th St., Philadelphia, Pa.*

Production Progress

Contractors and builders may find many uses for the above "Produc-Trol" boards, which provides a system to enable production and purchasing executives to quickly see all facts concerning raw materials, parts, and work in progress. Information of this kind is especially essential where multiple shift operations are maintained.—*Wassell Organization, Westport, Conn.*

Engine Oil

The recently announced Texaco Ursa Oil X**, fortified by a newly discovered detergent, provides a "washing" action that keeps deposits from forming in engines, and a dispersive action that holds deposit-forming material suspended in the oil. Carbon, sludge and other particles are drained away at regular drain periods. Ports, pistons, ring grooves, oil lines, screens, filters, etc., stay clean. The new oil is said to promise truck operators substantial operating and maintenance savings in greatly extended periods between port cleaning, re-ringing or overhaul.—*The Texas Co., 135 E. 32nd St., New York, N. Y.*

Coatings for Glass

To prevent injury caused by flying pieces of glass broken by vibration, a transparent protective coating for windows has been developed by Maas & Waldstein Co. Window glass or plate glass treated with this new coating,

WAR CONSTRUCTION

. . . factories, chemical and powder plants, foundries, storage sheds, boiler-houses, pump-houses, hangars, etc.

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Every sheet coated flat, then formed—an indication of its rugged quality.

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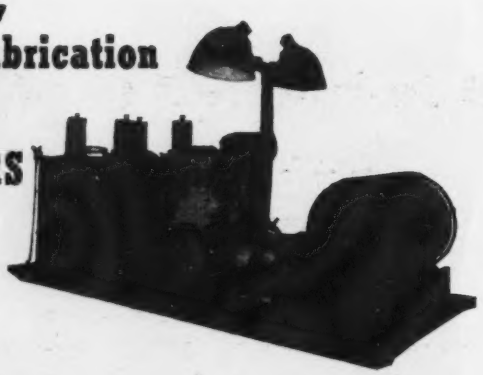
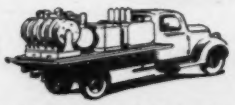


Completely assembled and boxed in one crate, Convoy Lubers can be unpacked, mounted on a truck or trailer, loaded with lubricants, and operating in a matter of minutes.



Mounted on truck or trailer Convoy Lubers bring pressure lubrication to the job, save time and money with complete modern lubrication facilities, with every hand gun, tool, adapter, and accessory at the operator's finger tips.

When truck or trailer is needed for other work, the Convoy Luber can be removed intact and full speed operation continued from the bare ground or a suitable platform.

★ Graco Convoy Lubers, for complete lubrication of construction equipment ON-THE-JOB, include engine-driven air compressor, powerful pneumatic lubricant pumps dispensing from original containers, one 50-ft. air hose and four 30-ft. lubricant hoses mounted on reels, tool box, and complete tool and accessory kit. In addition, some models like that illustrated, include a 110-volt lighting plant and flood lamps for night operation. The complete unit is assembled at the factory on a heavy steel frame and shipped to you ready to operate.
Stop lubrication delays . . . write or wire for prices and details.

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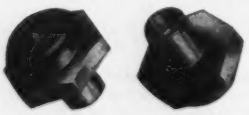
For insertion in castings



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TEST ELASTIC STOP NUTS on your products and equipment. Sample nuts will be furnished without cost or obligation.

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known as "Glasshield," is in effect turned into safety glass. A coated pane may break as the result of vibration, but it does not shatter.—*Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.*

Luminous and Reflector Chain

Luminous and reflectorized "cat eye" traffic and directional signs, road markers, etc., have been developed by the Star-Lite Co. of Indianapolis. A new feature on the reflectors is that they are luminous and thus visible at short distances in total darkness.—*Star-Lite Co., Indianapolis, Ind.*

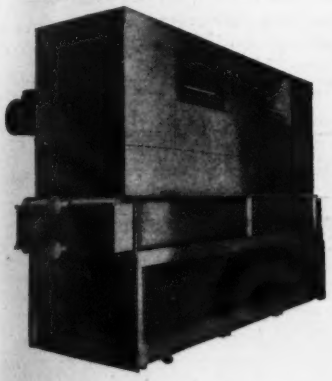
Portable Floodlights

The National Carbide Corporation has announced a new line of portable floodlights which give thoroughly dependable, adequate lighting for construction of repair work, for routine railroad checking jobs, or for any emergency use. General contractors, by the use of this new line of floodlights, can maintain night shifts on construction jobs without the usual delay and expense of installing permanent lighting systems. The NC-200 model, shown above, is the largest unit now being made, and has two 8000-candlepower floodlights constructed on swing joints, allowing for independent directional control with 16,000 candlepower concentration of light.—*National Carbide Corporation, 60 E. 42nd St., New York, N. Y.*

Pipe Locator

The Blake sewer locator has now been fitted for finding metal pipes, thus allowing one instrument to do the work formerly requiring two, and resulting in saving both in first cost and subsequent operation. For use in metal pipe finding, the battery and other electrical parts, instead of being concentrated in the trans-

mitter are diverted to the lost pipe. Two reels of insulated copper wire aggregating several hundred feet in length have their inner ends always connected with the battery and outer ones with spring clips for quick and reliable attachment to pipes without using pliers. An amplifying receiving coil, phones and all that is needed for locating both pipes and sewers, except the steel snake, are contained in an 8½x12x12 case.—*Frank N. Blake, North Adams, Mass.*



Quenching Oil Cooler

The Trane quenching oil cooler, a completely self contained and compact unit, designed to be placed inside the area in which the quenching oil cooling operation is conducted, or suspended from the truss structure of the building to conserve floor space, has been placed on the market. Mechanical features include a rigid angle iron framework with heavy gage side sheets; light weight, high heat transfer, cleanable type oil cooling coil; heavy gage steel spray water tank and angle supports.—*The Trane Co., La-Crosse, Wis.*

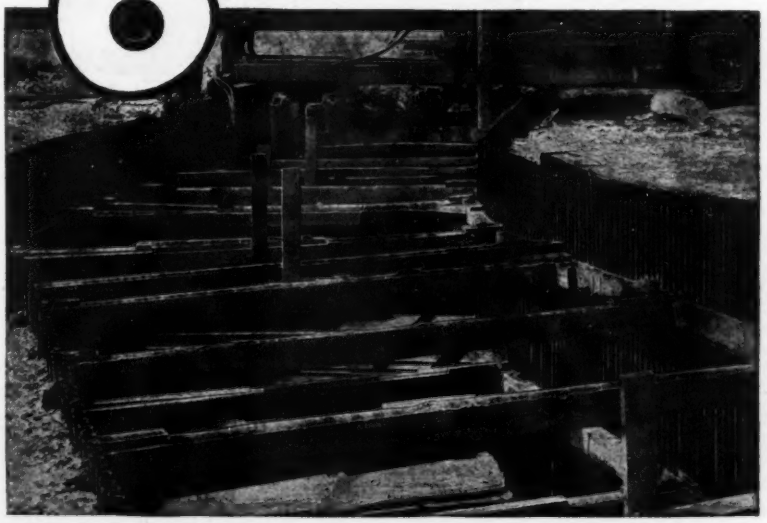
Blackout Paint

A blackout paint producing complete opacity with one coat, non-reflective to outside light, resistant to all weather conditions, and quick-drying, has been developed by the Skybryte Co. This new paint can be sprayed or brushed, and dries in 30 min.—*The Skybryte Co., Cleveland, Ohio.*

Water Meter Prover

A new meter prover for volumetric testing of water meters up to and including the 2 in. size consists primarily of a cylindrical tank to which is attached a welded steel box holding the meter connections, and a new type of rate of flow indicating device. The tank contains a division plate which separates it into two compartments, one holding 100 U. S. gallons and the other 10 gallons. Scales on the tank are adjustable for calibration and marked to read in percentages of

6 REASONS WHY



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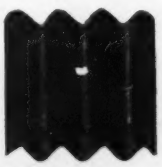
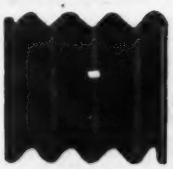


STANDARD



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error at the 100, 50, 10, 5 gallon and the 10, 5, 1 and ½ cu.ft. points. The prover will accommodate two ⅝ in. and two ¾ in. meters at one time and take single meters up to a length of 25 in.—*Pittsburgh-National Water Meter Co., Pittsburg, Pa.*

Expansion Loops Available

Expansion loops for any system and to any specification can be furnished by the Ric-wiL Co., completely prefabricated and factory sealed, for underground or overhead service for lines inside or outside of buildings.—*The Ric-wiL Co., Cleveland, Ohio.*

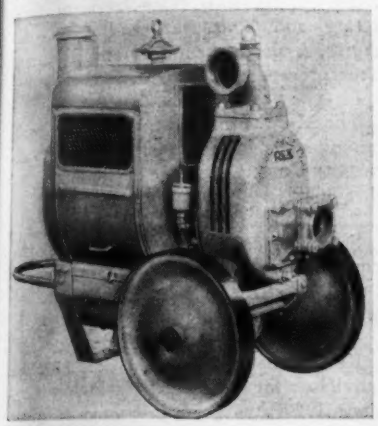
Protective Lighting

For lighting industrial fences and areas for protection against sabotage, Fresnel luminaires have been announced by Westinghouse Lighting Division. Two types are available for series and multiple circuits respectively. Units can be mounted on poles and building walls and consist basically of a hood with socket and receptacle, mounting bracket, a reflector and lens assembly.—*Westinghouse Lighting Division, Cleveland, Ohio.*

Blackout Bulb Unit

The Wabash Appliance Corp. has announced changes in its specifications for blackout bulbs, based on the results of exhaustive tests during the past few

months. Most important change is in color of light from blue and red to the deep orange recommended by the Office of Civilian Defense. Other changes reduce the size to 15 watts, eliminate the built-in reflector, and include an improved type of heavy black silicate coating to prevent light leakage.—*The Wabash Appliance Corp., 335 Carroll St., Brooklyn, N. Y.*



New Model Pump

The Chain Belt Co. announces a new model 4 in. pump with a capacity of 30,000 gal. per hour. This pump is powered by a 10-12 hp. air-cooled engine and has a simple design for dependable low-cost service. It is self-priming and has the patented Rex Z-Metal air peeler which peels the air from the impeller when the pump is priming or when it is actually pumping.—*Chain Belt Co., 1600 West Bruce St., Milwaukee, Wis.*

Emergency Repair Fittings

A group of plugs and sleeves for use on emergency repair of waterworks distribution systems has been developed by the James B. Clow & Sons. The fittings have been developed for use with any mechanical joint pipe manufactured by the company and can be installed quickly by the average workman using only a ratchet wrench. No lead or cracking of joints is required.—*James B. Clow & Sons, Chicago, Ill.*

Welding Rod Conserves Nickel

As a step toward conserving nickel for the war effort, the American Manganese Steel Division of the American Brake Shoe & Foundry Co., has available a new manganese welding rod known as V-Mang. An alloy steel containing 12 to 14 percent manganese, molybdenum and other elements, this electrode has resulted from research, and will replace Amsco nickel-manganese steel electrodes, except in a few exceptional cases. The rod will be priced the same as Amsco nickel-manganese steel rods.—*The American Brake Shoe & Foundry Co., Chicago Heights, Ill.*

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PREVENTIVE MAINTENANCE PROLONGS TRUCK LIFE!

Your General Motors Truck Dealer now offers a new kind of truck-saving service. It's *"Victory Maintenance"*—GMC's scientific answer to War-time needs for more efficient, long-life performance. "Victory Maintenance" employs the principles of preventive maintenance service proved by America's best-managed truck and coach fleets. It introduces new economies in service combinations. It cuts time out for repairs. It reduces upkeep and operating costs. Investigate GMC "Victory Maintenance"—enlist in this patriotic truck-saving, money-saving program today.

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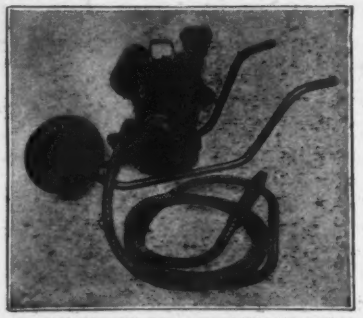

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CINCINNATI, OHIO

Manufacturers' Activities

Stockholders and directors of the CENTRAL IRON AND STEEL CO., Harrisburg, Pa., have re-elected all officers and directors for the coming year. Officers re-elected were HENRY S. EVANS, President, BASIL M. GRAHAM, Vice-President, Secretary and Treasurer, and JAMES E. JONES, Assistant Secretary and Assistant Treasurer.

The MILWAUKEE COKE & GAS CO. will hereafter be known as the MILWAUKEE SOLVAY COKE CO., according to a resolution adopted by stockholders recently.

S. L. BATES, formerly with the company's Ohio division, has been appointed Buffalo district sales manager for the WICKWIRE-SPENCER STEEL CO.

KENNETH C. FERGUSON, director of purchases for the H. K. FERGUSON CO., since 1920, has been promoted to vice-president in charge of purchases, according to a company announcement.

R. L. KIRKPATRICK has been appointed manager of the renewal parts section of the WESTINGHOUSE ELECTRIC & MFG. CO.

TUBE TURNS, Louisville, Ky., manufacturers of welded fittings and forged steel flanges, recently opened a branch office at Houston, Texas, located in Room 1707, Commerce Building. W. B. WHENTHOFF, formerly in charge of the company's office in Tulsa, Okla., is the manager of the new branch.

Three division managers of the GAR WOOD INDUSTRIES, INC., have been promoted to the rank of vice-president. They are: W. H. HAMMOND, sales manager of the Hoist, Body and Tank Division, J. B. HAILE, general manager of the Road Machinery Division, and G. E. ROBINSON, manager of the Winch Division.

CHARLES P. GILIKSON, former factory representative at Minneapolis for AMERICAN-MARIETTA CO., has been named assistant to ROLAND G. MAUS, sales manager.

ROY S. CAMPBELL, general manager since 1934, and vice-president since 1939, of the NEW YORK SHIPBUILDING CORP., has been elected president of the group.

The PEERLESS PUMP DIVISION of the FOOD MACHINERY CORP., Los Angeles, Calif., has announced the acquisition of the STERLING PUMP CORP., Hamilton, Ohio, and Stockton, Calif. Peerless will consolidate the Sterling plant at Hamil-

ton with the new Peerless plant at Canton, Ohio. The Stockton plant will be merged with the JOHN BEAN MANUFACTURING CO., a division of the Food Machinery Corp., at San Jose, Calif.

V. P. BLACK has been appointed to direct the activities of the AIRTEMP DIVISION of CHRYSLER CORP., in its price and order department, succeeding the late Carl Henze. Black, who has been advertising manager, will continue in that post, and will also handle the affairs of the AIRTEMP CONSTRUCTION CORP.

The general offices of CERTAIN-TEED PRODUCTS, formerly at 100 E. 42nd St., New York, have been moved to 120 S. La Salle St., Chicago. Also moved were the Certain-teed Laboratory, Engineering and General Manufacturing Department, which were formerly located at Buffalo, N. Y. The New York District Sales Department, the Export Department, and the Gypsteel Plank Division of Certain-teed will remain at present in New York.

J. STROTHER MILLER, technical adviser of the BARBER ASPHALT CORP., Perth Amboy, N. J., retired recently after 33 years of service with the company. He will continue his interest in asphalt technology as a consultant.

The H. O. PENN MACHINERY CO., with offices in New York City, Mineola, and Poughkeepsie, N. Y., have been appointed distributors for equipment manufactured by the NOVO ENGINE CO. of Lansing, Mich.

The EISEMANN MAGNETO CORP. has announced that it has closed its Chicago sales office, at 910 S. Michigan Ave., due to increasing defense activities. In addition to increased production of magnetos for use on defense equipment, the corporation has also undertaken the manufacture of other items for the government. RALPH DINNSEN and BILL WILLS, maintenance and service representatives at Chicago, will continue to cover the Chicago and Western territories to insure thorough field maintenance of the company's product.

PAUL H. DOW has been appointed district manager in the home office territory of the AIRTEMP DIVISION of CHRYSLER CORPORATION.

A reported increased demand for metering and control equipment in war industries has necessitated an enlargement of the BAILEY METER COMPANY'S field engineering staff. Among engineers who have been assigned to field duty are: J. T. ELDER and J. E. WOOD, to Atlanta; J. E. LUPPOLD, Seattle; E. P. NYE, Buffalo; R. B. POGUE, Milwaukee; W. D. HILBORN, Houston, Tex.; J. J. HASLAM, Kansas

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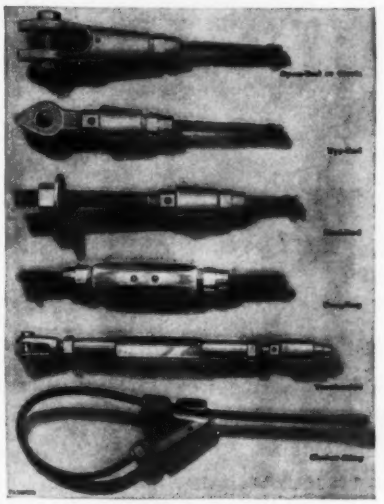
INSURE SAFETY . . . INSTALL QUICKLY
Streamline the Appearance
By Specifying
Electroline FIEGE CONNECTORS

WHEREVER wire rope is used, Electroline-Feige Connectors have proved their efficiency, on all types of equipment.

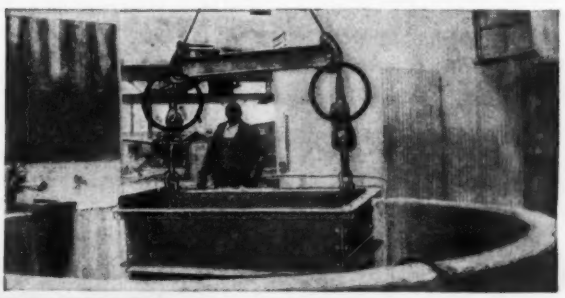
Compact and streamlined — simple and strong — easily installed, they are the first selection of experienced operators.

Their "feathered-off" compression grip greatly prolongs the life of the wire rope or steel strand to which they are attached—they are economical as well as safe.

Our New Bulletin F-2 gives full specifications and performance details. Write for it.



Available in Drop Forged SAE-1040 Steel, Rope sizes ¼" and larger, in black, hot-galvanized or cadmium-plated; also, in Rope sizes ½" and smaller, in bronze, stainless steel and monel metal.



On a Water Supply Tunnel Project, the City of Chicago handles loaded cars from the bottom of the entrance shaft with Electroline-Feige equipped cables.

The Electroline-Feige Inspection Hole insures a reliable connection because it shows, at a glance, the perfection of the joint

Electroline Company
4121 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS

"SQUEEZE ACTION" PUMP

Peerless HI-LIFT

R. Moineau's Patents, by exclusive license to Robbins & Myers, Inc.

UNIQUE CHROME ROTOR LIFTS WATER WITHOUT IMPELLERS, PISTONS, PLUNGERS OR VALVES

The unique Hi-Lift helical chrome rotor spirally squeezes water uphill without impellers, pistons, plungers or valves. Rotates at half usual turbine pump speed. Delivers capacities from 500 to 3500 gallons per hour. Very economical, extremely efficient, all forms of drive for all services.

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★ For wells as small as 4 in. in diameter

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341 West Avenue 26, Los Angeles, California
Send Hi-Lift Literature. No obligation.

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City, Mo.; J. J. WILBER, Cleveland; C. E. HICKS, New York City; J. R. POWELL, Pittsburgh, Pa.; S. G. DUKELOW, Denver, Colo.; R. V. JOHNSON, Chicago, Ill.; W. D. ROBINSON, Boston, and C. C. HOLTZMAN, to Philadelphia, Pa.

M. L. SLOAN, assistant manager of the Lamp department of GENERAL ELECTRIC Co. at Nela Park, Cleveland laboratories, has been promoted to manager of the department.

W. C. SMITH, INC., general contractors at Duluth, Minn., have opened offices in the Board of Trade Building, at Portland, Ore., with the intention of making it their main office.

RAY L. WILLIAMS, 55, service manager for the MARION STEAM SHOVEL Co., died recently at Marion. He had served the company for 32 years.

The SEAMLESS STEEL TUBE INSTITUTE, of Pittsburgh, Pa., has radically modified its product development program toward dissemination of technical data and useful practical information on tubing, together with such help as members of the organization may be able to give users of tubing to the end that designers, engineers and fabricators may save a maximum of time.

J. EDOUARD SIMARD, vice-president of SOREL INDUSTRIES, LTD., has become chairman of the control committee of the company which administers the plant on behalf of the Canadian Government, the British Government and Simard Brothers.

The GIRDLER CORP. of Louisville, Ky., has started construction of a $300,000 factory and engineering office building in Louisville. Plans call for 50,000 sq. ft. of floor space to house 100 employees in the machinery plant and office workers.

WILLIAM HARRIS, 2667 Beverly St., Highland Park, Salt Lake City, Utah, has been appointed sales representative and service engineer for the Sinta-Set products of the CARBOLOY Co., INC., Detroit.

New distributors recently added to the organization of the LE ROI Co., manufacturers of engines, air compressors, and engine-generator sets, include C. H. JONES EQUIPMENT Co., Salt Lake City, Utah, W. W. WILLIAMS Co., 835 Goodale Boulevard, Columbus, Ohio; STOCKBERGER EQUIPMENT Co., Fort Wayne, Ind.; NICHOLL-TALCOTT CORP., Hartford, Conn., C. A. KOEHRING Co., Houston, Texas.

THE TRI-STATE CULVERT & MACHINERY Co., of Atlanta, has been appointed distributor for the State of Georgia for EUCLID ROAD MACHINERY Co., Cleveland.

VIBER COMPANY CONCRETE

VIBRATION

MOST PROFITABLE FOR

REINFORCED CONCRETE BUILDING CONSTRUCTION

When the job calls for mass vibration—the Viber Vibrator at work above is your best bet. Especially made for walls over 10 inches thick, foundations, large girders, thick floor slabs, columns . . . large reinforced concrete bridges, grade separations, concrete floor systems, concrete arches and rigid frame structures . . . in a word, for all concrete with large aggregate and low water-cement ratio.

Write for complete VIBER data TODAY!

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WELDED FABRIC QUALITY

That Cuts Costs on Tough Jobs

UNIFORMITY of Clinton Welded Fabric, both in welding, and in tensile strength of the wire, raises performance standards, and assures maximum strength at welds. That's why experts prefer it for circular and other concrete shapes. Besides, it comes in sheets or rolls, cut to your *exact* job specifications . . . saving time and expense of on-the-job cutting. *Every step* in manufacture is completed in our own plant. From blast furnace to wire, to electrical welding, it is supervised and tested by our own experts. Wickwire Spencer Steel Company, 500 Fifth Avenue, New York, N.Y.

WICKWIRE PRODUCT

CLINTON REINFORCING FABRIC
It's Electrically Welded
WICKWIRE SPENCER

J. A. KRUGLER, formerly general sales manager for the TAYLOR-WHARTON IRON & STEEL CO., has been appointed vice-president in charge of sales and purchases. J. L. LONERGAN has been appointed superintendent of the company's plant at Easton, Pa.

B. W. CLARK, vice-president in charge of the WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY'S merchandising division, was appointed vice-president in charge of sales for the company recently. He succeeds RALPH KELLY, who resigned to become executive vice-president of the BALDWIN LOCOMOTIVE WORKS.

The CANADIAN MIXERMOBILE CO., LTD., of Vancouver, B.C., has appointed CONSTRUCTION EQUIPMENT CO., LTD., Montreal, as sole agents for eastern Canada.

The H. H. CROW EQUIPMENT COMPANY, 216 East Fourth Street, Little Rock, Ark., has been appointed authorized distributor for the hoist, body and tank divisions of GAR WOOD INDUSTRIES, INC., Detroit, Mich.

ALEX DOW, 79, internationally known utility executive and chairman of the board and former president of the DETROIT EDISON COMPANY, died at Detroit March 22.

JAMES MCGREGOR, 86, formerly president of the PONTIAC STEEL company of Pontiac, Mich., died at St. Petersburg, Fla., March 8.

Formation of a new Canadian government-controlled company, to be known as WARTIME METALS CORPORATION has been announced at Ottawa. JULES R. TIMMINS of Montreal, president of HOLLINGER CONSOLIDATED GOLD MINES, LTD., is president.

In line with plans for expansion, the NEW HOLLAND MACHINE COMPANY, of New Holland, Pa., has announced the purchase of the manufacturing and selling rights for the Stover limestone pulverizer, tractor saw attachments, saw frames, drag saws, etc., formerly built by the STOVER MANUFACTURING AND ENGINE COMPANY, Freeport, Ill.

B. K. PAGET has resigned as chief engineer and purchasing agent of the Ohio TUBULAR PRODUCTS CO., London, O., to assume a post as vice-president in charge of sales and engineering for the RUSHMAN-MOORE CO., INC., Cleveland, manufacturers of industrial ventilating equipment.

H. CARL WOLF, president of the Atlanta, Ga., GAS LIGHT company, has been elected president of the Atlanta Chamber of Commerce.

(*Continued on page* 117)

BIRTH OF AN ENEMY

Today, even the smallest spark is your potential enemy.

For today, once fire is born it may destroy machinery impossible for you to replace. It may destroy defense materials sorely needed by a hard-pressed nation.

That is why today, as never before, we urge you to seek out and eliminate every *source* of fire. But this alone is not enough.

All-important is to be prepared to put out fires that can and *do* start . . . immediately, automatically, *at the source!* That is the first rule of fire-fighting. And expert fire-fighters the country over will tell you no system will accomplish this more surely—more reliably—and with less water damage than a Grinnell Automatic Sprinkler System.

Grinnell Sprinkler Systems have such a record of trustworthy performance, that they quickly pay for themselves in reduced insurance premiums . . . then return them "cash dividends".

Built as a complete system by the world's leader in fire protection, a Grinnell System is prefabricated to an engineered layout to meet your special requirements, then installed with minimum disruption. Owners of fifty billion dollars worth of property say it's the best guardian of production and storage. Don't wait until it is too late. Write Grinnell Company, Inc., Executive Offices, Providence, R. I. Branch offices in principal cities.

Where Fires May Be Born in YOUR Plant

1 *At cables with combustible insulation.*
2 *At worn or frayed electrical cords.*
3 *At switches with loose connections.*
4 *Where welding is unsupervised.*
5 *Where open flames are used.*
6 *Where static is generated near flammable vapors.*
7 *At bridged fuses.*
8 *Where sparks are not confined.*
9 *At improperly oiled bearings.*
10 *Where workmen are careless with matches, cigarettes.*
11 *Where spontaneous ignition is possible.*
12 *At dirty flues and ducts.*
13 *At dirty, oily or overloaded motors.*
14 *Where light bulbs contact combustibles.*
15 *Where flammables are used for washing machine parts.*

GRINNELL
AUTOMATIC SPRINKLERS
For Production Protection

NEW PUBLICATIONS

New Publications listed will generally be sent gratis to those requesting them on stationery of companies engaged in the work they refer to. Requests of others, or for more than one copy, should be briefly explained. Address requests directly to the manufacturer.—Editor.

Painting Concrete—A new book on Medusa portland cement paint, called "Painting Concrete, Stucco and Masonry," offers a great deal of information on the painting of these surfaces, telling why a special paint is required and giving details of applying the paint.—*Medusa Products Co., 1000 Midland Bldg., Cleveland, Ohio.*

Housing—A handsomely illustrated booklet showing the contribution of the company's product to the accelerated program of defense housing has been issued by the Celotex Corp. The booklet shows in photographs the actual construction of a small home for a defense worker, in addition to interior scenes taken after the structure was completed and occupied.—*The Celotex Corp., Chicago, Ill.*

Cloroben—The Cloroben News, publication of the Cloroben Corp. for the Spring of 1942 has just been issued. It contains items of interest to sanitation engineers and tells how use of the project can be made to make up for the current shortage of chlorine.—*The Cloroben Corp., Jersey City, N. J.*

Winning the War—A new 24-page booklet "Something About Our Job in Helping to Win the War," has been issued by the Wickwire Spencer Steel Co. The booklet is intended to aid the war effort by showing employees how the products they turn out are actually used in military work and to show customers, suppliers and stockholders the contribution of the company.—*Wickwire Spencer Steel Co., 500 Fifth Ave., New York, N. Y.*

Enameled Porcelain—A new folder, showing uses of Porcelok porcelain enameled roofing and siding for hangars, ordnance plants, storage depots and other vital buildings has been issued. The booklet includes engineering and specification data for installing the product.—*Porcelok Co., Clyde, Ohio.*

Acid-Proof Piping.—A bulletin describing the resistance to acids, alkalis, solvents, corrosive chemicals and concentrated oxidizing agents found in "U. S. Standards" Chemical Stoneware Pipe is now available. The bulletin explains methods of production of the pipe and gives charts showing its use.—*The United States Stoneware Co., Akron, Ohio.*

Paints—A new catalog and price list covering paints, sundries and builders supplies is now available.—*Tamms Silica Co., 228 N. La Salle St., Chicago, Ill.*

Brass and Bronze—A booklet recently published by the Hammond Brass Works offers considerable engineering data and other information helpful in the specifying and purchasing of brass and bronze castings. Complete chemical analyses and physical properties are given, along with microphotos to show the various metallurgical structures. Applications and bearings in particular are discussed thoroughly.—*Hammond Brass Works, Hammond, Ind.*

Sampler—A well-bound, heavy paper folder containing samples of various types of plated metals and listing typical uses for them, has been issued as a guide to easy ordering.—*American Nickeloid Company, Peru, Ill.*

Earth Moving—Efficient methods and equipment for building defense projects was featured in a new folder designed for all county and government construction and earthmoving men, showing the application of LeTourneau equipment on road and airport construction, mining and industrial work.—*LeTourneau—"Caterpillar" distributors, or R. G. LeTourneau, Inc., Peoria, Ill.*

Fly Ash Elimination—A new bulletin, explaining collection of fly ash before it reaches smokestack, has been issued by the Western Precipitation Corporation. The booklet details the installation of a Multiclone assembly between the boiler and the stack which automatically collects solid particles with minimum draft loss.—*Western Precipitation Corporation, Los Angeles, Calif.*

Drawing Inks—The fourth edition of "Techniques" just issued by the Higgins Ink Co., Inc. is larger and more informative than any previous edition, comprising 38 pages of instructional material. The booklet is divided into four sections, explaining various techniques in the use of drawing inks.—*The Higgins Ink Co., Inc., 271-9th St., Brooklyn, N. Y.*

Care of Tires—A booklet explaining in complete detail the rules for the proper care of truck and bus tires and containing suggestions to enable truck and bus operators to obtain every possible mile of service from their present tires has been released by the Firestone Tire & Rubber Co. Illustrations describe methods of conserving wear and show damage

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for BLUE BRUTE Portable Compressors, Rock Drills and Air Tools. Get your EQUIPMENT-SAVER — FREE
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Lincoln — Highway Equipment & Supply Co.
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Irvington — Smith Tractor & Equip. Co., Inc.
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Binghamton — MacDougall Equipment Co.
Buffalo — Dow & Company, Inc.
Glens Falls — Collin, Fox Co., Inc.
New York — Hubbard & Floyd
Olean — Freeborn Equipment Company
Oneonta — L. P. Butts, Inc.
Syracuse — Harrod Equipment Company
Troy — Briggs Machinery Company, Inc.
NORTH CAROLINA
Durham — Constructors Supply Company, Inc.
OHIO
Cincinnati — Finn Equipment Company
Cleveland — Gibson-Stewart Company
Marietta — Northwest Supply & Equipment Co.
Toledo — M. W. Kilcorse & Company
OKLAHOMA
Oklahoma City — Town-Sco Equipment Co.
OREGON
Portland — Andrews Equipment Service
PENNSYLVANIA
Allentown — H. N. Crowder, Jr. Co.
Easton — Sears & Bowers
Harrisburg — N. A. Coulter
Oil City — Freeborn Equipment Company
Philadelphia — Metalweld, Inc.
Pittsburgh — John McC. Latimer Company
Wilkes-Barre — Ensminger & Company
SOUTH CAROLINA
Columbia — Bell-Lott Road Machinery Co.
TENNESSEE
Chattanooga — James Supply Company
Memphis — Tri-State Equipment Company
TEXAS
Dallas — Shaw Equipment Company
Houston — McCall Tractor & Equipment Co.
San Antonio — Patten Machinery Company
UTAH
Salt Lake City — James A. Wade Company
VIRGINIA
Richmond — Highway Machinery & Supply Co.
WASHINGTON
Seattle — Star Machinery Company
Spokane — General Machinery Company
WISCONSIN
Eau Claire — Bradford Machinery Company
Green Bay — Nelson Machinery Company
WYOMING
Cheyenne — Wilson Equipment & Supply Co.

Get more WORTH from air with WORTHINGTON

Big Blue Brutes

Worthington Pump and Machinery Corporation, Harrison, N. J. Holyoke Compressor and Air Tool Department. Holyoke, Massachusetts.

THIS BRUTE'S AN EASY BREATHER

Here's a brute for work — but *easy-breathing*, even after long hours of trouble-free, continuous delivery of air!

Worthington's famous Feather* Valves insure a simple "breathing" action without noise or destructive impact. The *punch* is where you want it, *on the job*, not in the compressor!

That's one reason why Worthington Blue Brute Compressors . . . gasoline-driven, diesel or electric . . . stay on the job longer, without costly delays for maintenance or repairs.

Investigate the whole Worthington line of Blue Brute Compressors, Rock Drills and Air Tools. *Compress more air . . . use less air . . . get more WORTH from air with WORTHINGTON.*

EQUIPMENT SAVER—FREE

The name of your nearest Worthington distributor is printed on page **98**. Ask him — today! — about Worthington's EQUIPMENT SAVER, free to all users of compressors and air tools. It will show you how to conserve scarce metals, lower your maintenance costs. If your distributor is not listed, let us know and we'll send you this cost-cutting aid to efficient production direct from Holyoke.

* Reg. U. S. Pat. Off.

On the Job with

BLUE BRUTES

On a midwest construction job — the contractor reports, "5 Blue Brute Compressors in service six months and not a wrench used except when changing oil!"

Blue Brutes are performing like this in hundreds of army camps, navy yards, air bases, and ordnance plants throughout the country.

See distributor list page 98

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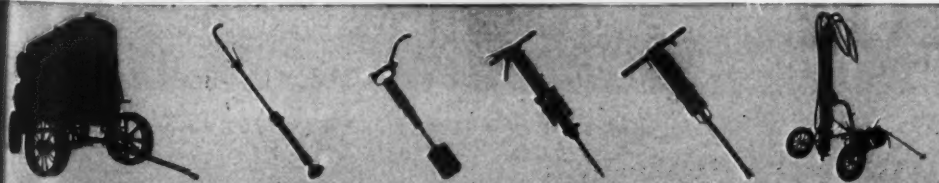
BUY BLUE BRUTES



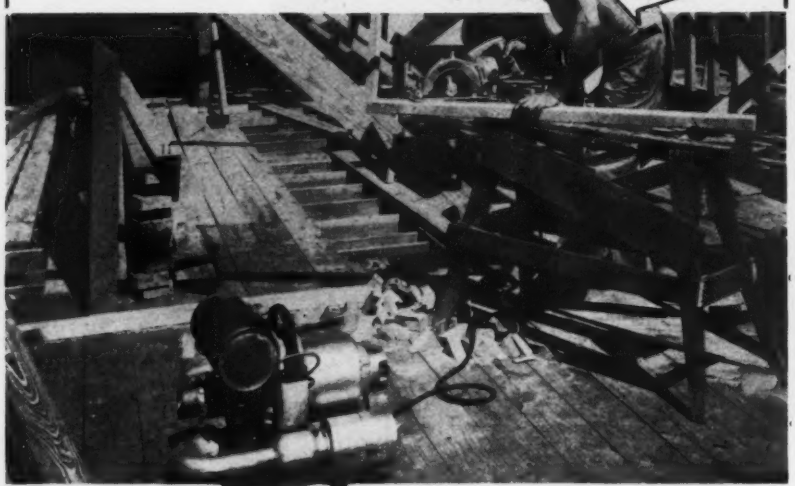
Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

WORTHINGTON

Worthington Pump and Machinery Corporation, Harrison, N. J. Holyoke Compressor and Air Tool Department, Holyoke, Massachusetts

POWER WORK

is Cheaper and Quicker than Hand Work



1800 watt Homelite Generator weighs only 83 pounds complete with built-in engine. One man can carry it easily.

Use HOMELITE PORTABLE GENERATORS for Operating Electric Tools

There's no doubt about it, power tools save time and money—and a quick, easy and inexpensive way to feed power to those tools is with Homelite Portable Generators. Light and portable, these compact gasoline-engine-driven generators can be quickly set up at any spot on a job. You don't have to wait or pay for power installations. And you don't have long, troublesome cables running all over the lot.

Capable of generating 1800 watts—with automatic voltage control—these generators can be used to operate *at top capacity* saws, drills, vibrators or many other tools—several at a time—or brilliant floodlights when there is night work to be done.

Good for Plenty of Service—Just take these simple precautions and your Homelite will operate better and longer.

- Keep your Homelites in good condition.
- Mix ½ pt. of No. 30 oil with each gallon of gasoline used.
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- Keep the carburetor set on the lean side.
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Send for our service manual.

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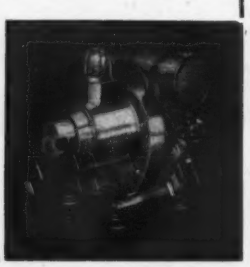


done by various abuses of practice.—*The Firestone Tire & Rubber Co., Akron, Ohio.*

Valves—Quick-operating valves for fire protection, vital safeguards for every plant engaged in war production, are described in a new bulletin. The publication explains how the various types of valves for this service are designed either for emergency shut-off or diversion of the flow of inflammable liquids, or for diversional concentration of water to sprinkler deluge or water curtain systems.—*Everlasting Valve Co., 49 Fisk St., Jersey City, N. J.*

Jack Bits—The advantages of detachable Jackbits are described in a two-color, 24-page bulletin announced by Ingersoll-Rand Co. This new bulletin called "How Jackbits Reduce Rock Drilling Costs" contains more than fifty illustrations, a table showing the types of Jackbits recommended for different kinds of work, and various costs data.—*Ingersoll-Rand Co., Phillipsburg, N. J.*

Ventilation—Stressing the need for proper ventilation and healthful inside temperature an essential to the needs of speeding up production lines, the United States Air Conditioning Corp. has issued a bulletin describing its new Kooler-aire evaporative cooling system.—*United States Air Conditioning Corp., Minneapolis, Mich.*

Machines and Records—A 103-page, handsomely illustrated catalog giving a blueprint for the use of "Administrative Machine Tools of Management," has been produced by the Systems Division of Remington Rand, Inc. The book tells the whole story of the important part Systems products are playing in expediting all the available "fact-power" remaining during 1942.—*Remington Rand, Inc., Buffalo, N. Y.*

Thickeners and Clarifiers—A 4-page bulletin showing uses and details of construction of Hardinge thickeners and clarifiers in various industrial operations is now available.—*Hardinge Co., Inc., York, Pa.*

Cement—A booklet just published by North American Cement Corp., entitled "The Selective Use of Portland Cement" is now available.—*North American Cement Corp., 285 Madison Ave., New York City.*

Insulation—A current issue of the house organ "Performance" has been published by the National Mineral Wool Association. The booklet describes various installations of mineral wool insulation and gives comparative heating data

When groundwater becomes a troublemaker it's time to get tough. You can wield a "big stick" by using ARMCO Perforated Pipe to eliminate the source of surface failures and excessive maintenance once and for all.

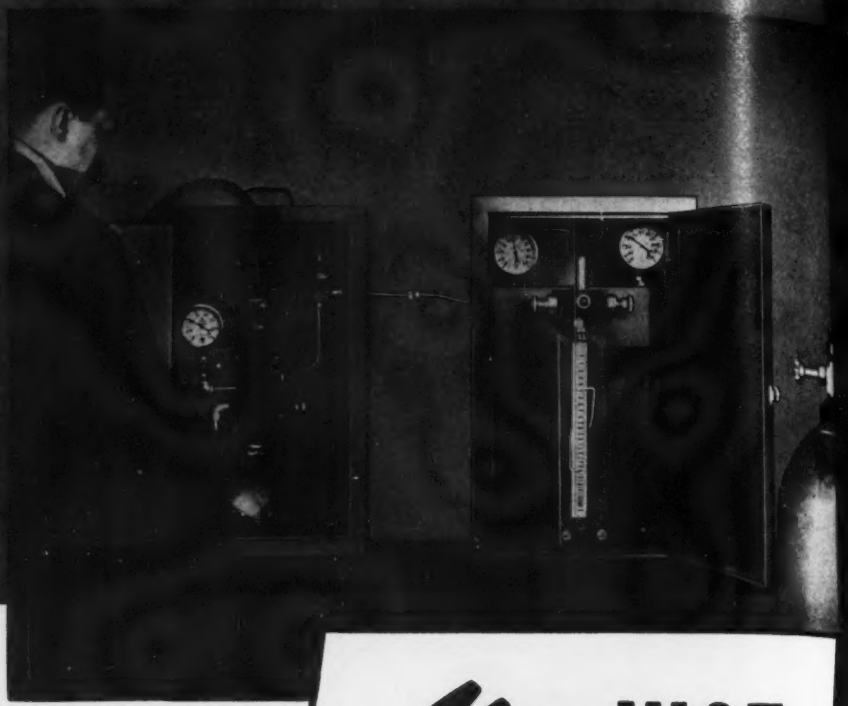
An ARMCO subdrainage system is a lasting improvement that soon pays for itself. Thanks to flexible corrugated metal design and sturdy band couplings, ARMCO Pipe will not crush or disjoint. Shifting soils, traffic impact and severe frost action are no hazards. Under-the-ground service records assure long material life and scientific design means continued high efficiency. There is no danger of clogging.

For a practical demonstration try ARMCO Perforated Pipe on your worst subdrainage problem. Use it to guard highways, railroads, airports or wherever else groundwater threatens. Write for the whole story. ARMCO DRAINAGE PRODUCTS ASSN., 175 Curtis St., Middletown, Ohio.

ARMCO ARMCO **PERFORATED PIPE**

Safe water FASTER

. . . IN ANY EMERGENCY!



Here's a unit you can depend on for *any* job requiring chlorination of water "on location" without delay. Indispensable for emergency protection, it has continual usefulness at *all* times for dead-end flushing, main sterilization, and other chlorination needs away from the plant.

Development of this new portable unit is the latest step in the W&T program aimed to help protect the nation's water supplies in any emergency. It supplements the service of the new W&T chlorination trailer, W&T mobile water purification plants and other equipment meeting special civilian and military needs. Back of these units, of course, is the full line of regular W&T Chlorinators, now being widely applied to raise the protection standards of permanent water treatment installations.

Wallace & Tiernan Representatives are prepared to assist you in getting the most effective use out of your present equipment. If new equipment is required, they'll help you choose types having long-term usefulness after the emergency is over. For help in meeting regular or emergency needs . . . for aid on safety problems, taste and odor problems or microbiological control of industrial process water, just call W&T. SA-130

New W&T PORTABLE CHLORINATOR

1. Easily portable to the point of need
2. Designed to save time in "hooking up"
3. Wide capacity range
4. Solution or direct feed
5. Compensated to give constant flow
6. Complete with tools and accessories

(For complete information and specifications, write W&T for Technical Publication No. 231)

"The Only Safe Water is a Sterilized Water"

WALLACE & TIERNAN CO., INC.

MANUFACTURERS OF CHLORINE AND AMMONIA CONTROL APPARATUS
NEWARK, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

on various types of construction.—*National Mineral Wool Association, 1270 Sixth Ave., New York, N. Y.*

Airport Lighting—For use in airport lighting design, a new 42-page bulletin has been introduced by Westinghouse Electric & Mfg. Co. Typical layout plans with C.A.A. recommendations are given for airports with runways of some 1500 to 4500 ft. Distribution facilities described include circuit breakers, transformers, relays and cutouts. Control panels with floodlight and contact light control are outlined to show physical position of important parts.—*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.*

Concrete—A 16-page booklet describing the use of Atlas Lumnite cement in making concrete which has full working strength in less than 24 hours of placing has been issued. The booklet also gives detailed information on placing and finishing concrete floors ready for service the following day.—*The Atlas Lumnite Cement Co., Chrysler Bldg. New York N. Y.*

Centrifugal Pumps—A catalog showing many types of heavy duty multi-stage centrifugal pumps, including cross section photographs showing details of construction is now available.—*Pennsylvania Pump and Compressor Co., Easton, Pa.*

Air Conditioning—A condensed catalog covering air conditioning, refrigeration and space heating equipment manufactured by the company, has just been published by Carrier Corporation. Profusely illustrated, and containing detailed specifications, the catalog is divided into sections describing self-contained Weathermakers, and equipment for summer and winter air conditioning, dehydration, refrigeration, low temperature air conditioning and industrial and commercial heating.—*The Carrier Corporation, Syracuse, N. Y.*

Blackout Precautions—A bulletin entitled "Air Raid and Blackout Precautions for the Protection of Windows" has been issued by the Pittsburgh Plate Glass Co., based upon a study of experience and practice in Great Britain, plus certain experimental data developed in the United States.—*Pittsburgh Plate Glass Co., Pittsburgh, Pa.*

Soil Cement—Allis-Chalmers Mfg. Co. has issued a bulletin listing complete line of specialized tools for use in construction of soil cement on highways, airports, etc. Printed in two colors, the catalog illustrates and describes the necessary tractors, graders, disks, harrows, subgraders, etc.—*Allis-Chalmers Mfg. Co., Milwaukee, Wis.*

Trucks—A complete listing of the many types of trucks being utilized by the United States Army and by contractors on defense jobs has been published in a catalog by the Marmon-Herrington Co. Inc. Featuring the "all-wheel drive," the bulletin gives specifications of the trucks and shows many illustrations of their uses.—*The Marmon-Herrington Co., Inc., Indianapolis, Ind.*

Rolling Doors—The many and varied uses of steel rolling doors, grilles and fire doors are shown in a new catalog issued by the Kinnear Manufacturing Co. Specifications of the doors are given in detail.—*The Kinnear Manufacturing Co., 820–870 Fields Ave., Columbus, Ohio.*

Vibrating Screen—X-Ray Bulletin No. 115, which attempts to give all facts about the Gyrex Vibrating Screen produced by the Robins Conveying Belt Co., has been issued recently. The bulletin lists changes and new adaptations of the equipment.—*Robins Conveying Belt Co., Passaic, N. J.*

Transformers—A catalog presenting the complete line of transformers for broadcast, amateur, laboratory and replacement purposes, produced by the United Transformer Co., has just been mailed.—*United Transformer Co., 150 Varick St., New York, N. Y.*

Preservation—Prepared in vest pocket size for easy carrying, the B. F. Goodrich Co. has published four of a series of six pamphlets on "How to Get the Most Service Out of Industrial Rubber Products." The series is designed to assist in the tremendous program of rubber conservation now made necessary by war developments.—*The B. F. Goodrich Co., Akron, Ohio.*

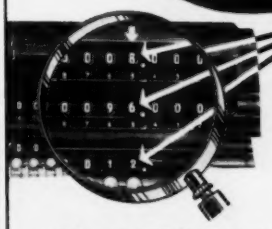
Dust Collector—A 58-page revised catalog, describing American dust-proof dust collectors has been published. Prepared as a manual to serve plant engineers and officials, it provides full information and photographs of models available, with operating data, construction features and basic specifications.—*American Foundry Equipment Co., 555 South Byrkit St., Mishawaka, Ind.*

Temperature Controller—Improvements in the Taylor self-acting temperature controller during the past few years, and many new uses for the product, are described in a new catalog just issued.—*Taylor Instrument Company, Rochester, N. Y.*

Weatherproofing—A descriptive manual designed to show how the product will save money and materials on asphalt

(*Continued on page* 112)

for *Accurate Bills of Material* and other uses!



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the electric calculator with straight-line figure dials for ALL 3 FACTORS!

Save the time of high-wage personnel now figuring with pencil and paper, or with eye-straining approximating devices having uncertain decimal points. A MARCHANT gives "the answer" quicker . . . correctly pointed off . . . and with *all 3* factors in plain sight for checking.

This is why MARCHANT is so popular in shop and field . . . and explains why more and more firms are putting one within convenient reach of each desk.

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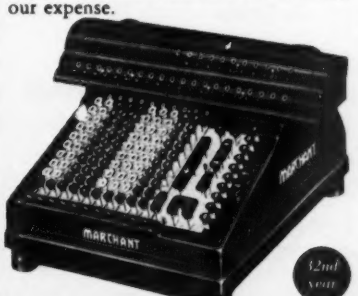

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HOME OFFICE: OAKLAND, CALIFORNIA, U. S. A.
Sales Agencies and Manufacturer's Service Stations Give Service Everywhere!

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☐ *Send* Feature Analysis Folder.

☐ *Send* "7 Place Natural Trig. Functions with Increments to Seconds," with supplemental Sine-Arc and Sine-Cosine tables. (*25 cents in stamps enclosed*).

☐ *Send* "Simplified Sq. Root Method."

☐ *Send pamphlet* "Earthwork End-Areas, Volumes, and Mass Diagrams."

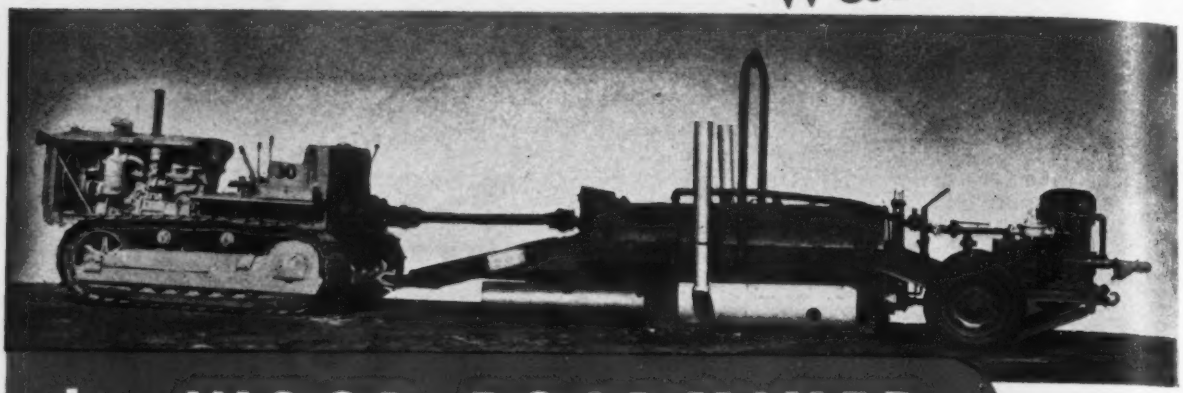
Firm _____

Individual _____

Address _____

Use margin of page if necessary

Tough paving jobs wanted!



by WOOD ROADMIXER

A decade of leadership in the traveling plant method of low-cost, rapid construction of all types of asphaltic mats and stabilized bases has proven time after time that there isn't any job too tough for a Wood Roadmixer. Swampy, sandy sub-grades—steep mountain grades and sharp, super-elevated curves—boggy and unstable sub-bases—these are paving difficulties which Wood Roadmixer takes in stride.

CONTINUOUS "ONE-PASS" MIXING *The soil or aggregate to be mixed is bladed or dumped in a measured windrow. While the complete traveling plant assembly is moving along at a uniform speed, the Roadmixer picks up the material off the sub-base. As the material passes through the mixing drum the metered liquid binder is introduced under a controlled pressure, after which the thoroughly and completely mixed material flows from the mixer and is deposited in equalized windrows for spreading over the sub-base.*

A COMPLETE TRAVELING MIXING PLANT

The Wood Roadmixer is a complete traveling mixing plant pulled and powered by a standard Track-type tractor. It is mounted on a rigidly welded main frame supported in the rear by pneumatic dual-tired wheels and in the front by the tractor draw-bar. Its simple, compact assembly utilizes a minimum of moving parts and does away with complicated, troublesome bucket elevator, belt elevators, etc. The Wood Roadmixer is as easy and simple to operate as a scraper and will maintain grade on either a hard or soft sub-base.

HIGH CAPACITY—LOW OPERATING COST

Under ordinary conditions on stabilization work the Wood Roadmixer is capable of averaging 100 cubic yards of compacted base per hour—133 cubic yards of loose windrow per hour. Even greater efficiency is possible under favorable conditions. This high capacity is attained at low cost because normally two men can handle the tractor and Roadmixer. Furthermore, fuel consumption is exceptionally low.

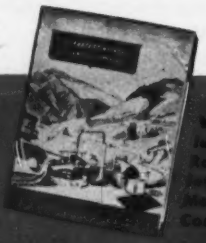
60,000,000 SQUARE YARDS OF PROOF

Over 60,000,000 square yards—the equivalent of several thousand miles of low-cost pavements built in over 31 states and 7 foreign countries is conclusive proof that Wood Roadmixer offers the fastest, most satisfactory and most economical method of paving streets, roads, highways and airport and landing field runways. Actual records kept on jobs of varying operating conditions offer further and indisputable proof of the all-round superority of the Wood Roadmixer.

Because of the enormous call on Wood Roadmixers for tough National Defense projects, we may not always be able to promise you immediate deliveries.

WOOD ROADMIXER

Wood Manufacturing Co. • 208 West 8th St., Los Angeles, California



Write for illustrated Wood Roadmixer bulletin, "The Fast Method of Low-Cost Paving."

MEETINGS

AMERICAN SOCIETY OF PLANNING OFFICIALS, Indianapolis, Ind., May 24–28.

ASSOCIATED EQUIPMENT DISTRIBUTORS, 23rd semi-annual meeting, Edgewater Beach Hotel, Chicago, Ill., June 8–10.

AMERICAN WATER WORKS ASSOCIATION, Stevens Hotel, Chicago, June 21–25.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION, 50th annual meeting, Columbia University, New York City, June 29–July 2.

REGIONAL AND LOCAL MEETINGS

NEW YORK SECTION, AMERICAN WATER WORKS ASSOCIATION, spring meeting, Hotel Niagara, Niagara Falls, N. Y., April 30–May 1.

NEW ENGLAND WATER WORKS ASSOCIATION, Manchester Country Club, Manchester, N. H., May, 1942 (Date to be announced.)

SOUTHEASTERN SECTION, SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION, annual meeting, North Carolina State College, Raleigh, N. C., May 1; Duke University, Durham, N. C., May 2.

MARYLAND-DELAWARE WATER AND SEWERAGE ASSOCIATION, 16th annual conference, Alexander Hotel, Hagerstown, Md., May 7–8.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS, annual convention, Hotel New Yorker, New York, N. Y., May 14–16.

CENTRAL STATES SEWAGE WORKS ASSOCIATION, annual convention, Minneapolis, Minn., June 18–19.

Elections and Activities

WILLIAM R. WOOTEN, city engineer of Tulsa, Okla., is the new president of the Oklahoma Society of Professional Engineers. Mr. Wooten, who was vice president, succeeded Stanley Learned, who resigned recently to devote himself fully to war activities.

The TEXAS GOOD ROADS ASSOCIATION recently elected Fred Wemple, of Midland, as president, during an annual meeting at Austin. Other officers chosen were: Rufus Higgs, Stephenville, first vice president; John S. Redditt,

AMERICAN ALL-STEEL PILE SHOES

Have Speeded the Driving and Minimized the Wastage on Over 1,000,000 Piles!

YESTERDAY—**American All-Steel Pile Shoes** were used on the wood piles under the World's Fair Perisphere, and to speed construction of many outstanding buildings, bridges, and piers throughout the nation.

TODAY—**American All-Steel Pile Shoes** help hasten the completion of new shipyards, war production plants and other essential structures.

TOMORROW—You can specify **American All-Steel Pile Shoes** on your next job... get prompt delivery... and assure fast, safe, economical driving of piles to maximum desired depth. **American All-Steel Pile Shoes** are available in three sizes for wood piles, one size for pre-cast concrete piles. Write us for full information now!

5 "AMERICAN" FEATURES

1 Nail holes permit easy, fast, permanent application.

2 "Bending" hole assures snug fit to sides of slightly smaller piles.

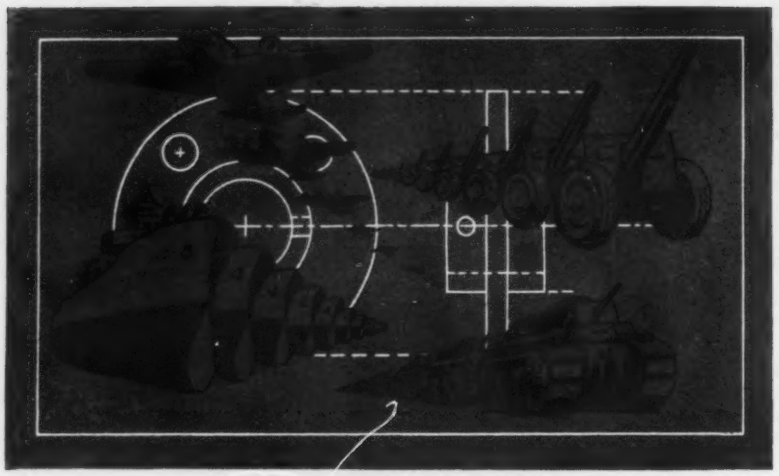
3 Sides are made of two sturdy ¼" steel shapes.

4 Shoe is assembled by careful welding with coated wire.

5 Sharpened point is produced from solid steel bar stock.

The American Pulley Company

4290 WISSAHICKON AVE., PHILADELPHIA, PA.



TRACING CLOTH
for a "Blueprint for Victory"

Speed . . . speed . . . and more speed is the watchword! Plans for ships, planes, tanks and guns *must* not be delayed by inferior tracing cloths or blueprints! Today, thanks to the fine quality of Arkwright Tracing Cloths, they need not be.

Years of testing in Arkwright laboratories . . . years of intensive scientific research . . . insistence on highest quality materials and highest standards of manufacture have prepared Arkwright for the present emergency. Today, you can order Arkwright Tracing Cloths with the same confidence in quality . . . the same assurance of rapid delivery that has given Arkwright its recognized position as the leading American producer of tracing cloth for over twenty years. Arkwright Finishing Company, Providence, R. I.

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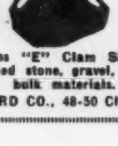
Hayward Buckets



Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.
THE HAYWARD CO., 48-50 Church St., N. Y.

EPPINGER AND RUSSELL CO.
Wood Preservers Since 1878
All kinds of Structural Timbers and Lumber Pressure Treated with Creosote Oil or
DU PONT CZC Chromated Zinc Chloride
80 EIGHTH AVE., NEW YORK, N. Y.
POLES, CROSS ARMS, PILING, TIES POSTS, BRIDGE AND DOCK TIMBERS
TREATING PLANTS
Jacksonville, Fla. Long Island City, N. Y.

Lufkin, second vice president; H. B. Zachary, San Antonio, third vice president; Franz Groos, San Antonio, secretary-treasurer; Datus E. Proper, San Antonio, executive vice president. The group urged by resolution that after the military access road program had advanced to a desirable stage, that state and federal governments cooperate in developing the regularly established routes of travel for military and civilian use.

EARL LLOYD, deputy state engineer of Wyoming, has been elected president of the Wyoming Engineering Society at an annual convention held recently in Cheyenne. Mr. Lloyd was secretary of the Society since 1938.

J. B. STIRLING, vice-president of the E. G. M. Cape and Company, Montreal contractors, has been elected president of the Canadian Construction Association.

D. A. HANSEN, manager of the Calgary Power Co., Ltd., has been elected president of the Alberta Section of the Engineering Institute of Canada.

THE FLORIDA Road Builders Association, at their annual meeting in Tallahassee, elected E. C. Langston, of Orlando, as president, and re-elected James H. Craggs of Ocala, vice president; and Harold M. Birtley of Tallahassee, secretary.

THE 23RD semi-annual meeting of the Associated Equipment Distributors will be held at the Edgewater Beach Hotel, Chicago, June 8, 9 and 10, in conjunction with distributors' week. Sessions on Monday, June 8, and Tuesday morning, June 9, will be closed to all except regular members. Those held Tuesday afternoon and Wednesday morning will be open for regular, allied and associated members. Wednesday afternoon will be devoted to manufacturers' group meetings.

HAROLD F. HAMMOND, director of the traffic division of the National Conservation Bureau, New York, was principal speaker at a recent meeting of the Connecticut Section of the American Society of Civil Engineers. Speaking at Hartford, Mr. Hammond discussed major traffic and transportation problems, and told members how critical situations are being handled.

MEMBERS of the Arizona Sewage and Water Works Association elected H. H. Idle, of Globe, as president of the organization, at a recent two-day Spring conference. Other officers named were: E. S. Borqquist, Tucson, first vice-president; George V. Marx, Phoenix, second

vice-president; Richard Bennett, Phoenix, secretary-treasurer.

THE STRUCTURAL ENGINEERS' Society of New York, at a recent annual meeting, elected Frederick A. Burdett, president, and Harry V. Spur, vice president.

THE ANNUAL meeting of the Southeastern Section of the Society for the Promotion of Engineering Education will be held at the North Carolina State College, Raleigh, May 1, and at Duke University, Durham, May 2. Dean N. W. Dougherty, of the University of Tennessee College of Engineering, is chairman of the group.

JAMES A. MCCRORY, chief engineer of the Shawinigan Engineering Co., Ltd., of Ottawa, Canada, has been named president of the Corporation of Professional Engineers of the Province of Quebec.

LT. COL. W. S. WILSON, secretary and assistant dean of the Faculty of Applied Science and Engineering of the University of Toronto, was elected chairman of the Toronto branch of the Engineering Institute of Canada at a recent annual meeting. Other officers elected include: W. H. M. Laughlin, vice chairman; S. H. de Jong, secretary-treasurer.

THE 50TH annual meeting of the Society for the Promotion of Engineering Education will be held in New York City at Columbia University, June 27 and 28. The meeting will consider "The Engineering College at War."

HOMER HUNTER, superintendent of the Dallas city water department, was elected president of the Dallas branch of the American Society of Civil Engineers at a recent election. Other officers named are E. L. Myers, vice president; J. L. O'Hearn, secretary; F. A. Martine and T. E. Huffman, directors.

CLARENCE E. MERRITT, a senior engineering student in the University of Toledo, has been elected president of the recently organized University of Toledo, Society of Civil Engineers. Lawrence M. Friedrich, associate professor of civil engineering, and Dr. Erman O. Scott, professor of engineering mechanics, are acting as advisers to the new organization, which includes about 30 members.

CAPT. N. H. HECK, assistant to the director of the United States Coast and Geodetic Survey, recently received the William Bowie Medal from the American Geophysical Union as recognition for his 38 years of service with the Survey. During the meeting, held at George

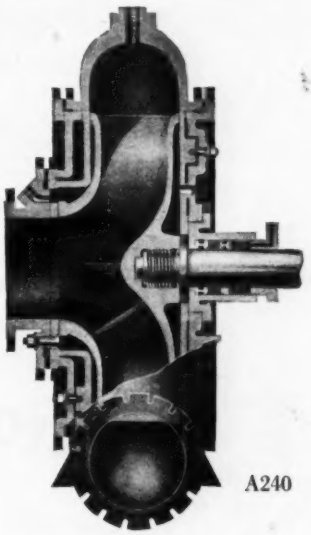
Amsco "COUNTERFLOW" *Pump* Produces Sand and Gravel for Arkabutla Dam

Arkabutla Dam, a government flood control project on the Coldwater River in Mississippi, will require approximately 4,158,000 cu. yds. of earthfill. The dam proper will be about 10,000 ft. long. A reservoir of 52 sq. miles will be provided.

Gravel and sand for the drainage mat at the base of the fill, and gravel for the spillway were supplied by Kochtitzky & Johnson, sand and gravel producers and dredging contractors of Avalon, Miss. Their dredge is equipped with a 16" Amsco "COUNTERFLOW" Pump, type "XH-CF", Form 44, right hand bottom discharge construction.

The "COUNTERFLOW" design effects the circulation of clear water under pressure, between the impeller shrouds and side plate liners, keeping out grit-laden water that would otherwise cause abrasive wear. This feature, together with free-flow impeller passages and the use of tough, impact and abrasion resistant 13% manganese steel for the impeller, shell, side plates and liners, assures a maximum service life with minimum maintenance.

Aggregates producers have long used Amsco Pumps successfully and today more than half of the dredge pumps in that work bear the Amsco trade-mark.



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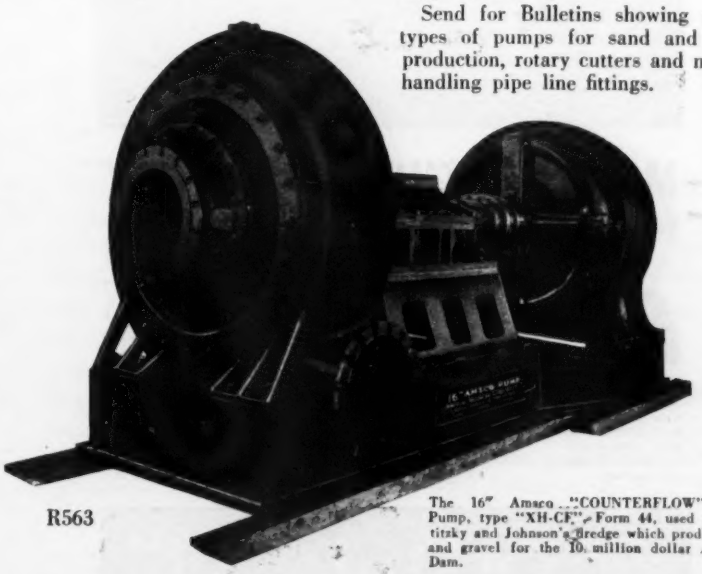
"COUNTERFLOW" design details are shown on the section drawing above. Note clear water is forcibly circulated between the impeller shrouds and side plate liners. Wide passage, funnel-mouth impellers are used and are screwed onto the pump shafts for maximum security and ease of replacement.

The shock and abrasion resistant qualities of genuine manganese steel make it ideal for Rotary Cutters; and Dredge Pipe Line Fittings, such as elbows, pipe, nipples, reducers, expansion joints, hose nipples, and flap valves.

Send for Bulletins showing various types of pumps for sand and gravel production, rotary cutters and material handling pipe line fittings.



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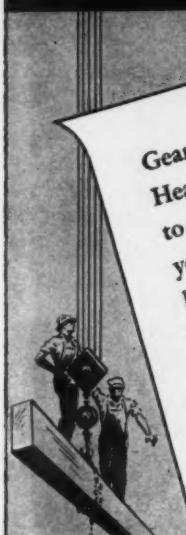
The 16" Amsco "COUNTERFLOW" Dredge Pump, type "XH-CF", Form 44, used on Kochtitzky and Johnson's dredge which produced sand and gravel for the 10 million dollar Arkabutla Dam.

Amsco
AMERICAN MANGANESE STEEL DIVISION
OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
Chicago Heights, Illinois

Manganese Steel Castings for shocks and abrasion
Chromium-Nickel Alloy Castings for heat and corrosion resistance
Power Shovel Dippers. Dredge and Industrial Pumps
Welding Materials for reclamation and hard-surfacing

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO. OFFICES IN PRINCIPAL CITIES

BIG REDWOOD
for BIG Needs



Geared to meet wartime needs for Redwood in Heavy Construction, Union Lumber Company, to a man, is on the job for Uncle Sam. Fifty years' experience in supplying Redwood for bridges, tunnels, industrial uses. When it's "S.O.S. Redwood," let Union Lumber go into action as your Source of Supply.

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SAN FRANCISCO, Crocker Building
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FACILITIES ★ EXPERIENCE

MEETING THE EMERGENCY

Reflector Signs now easily made with "REFLECTO-CHAIN"

FOR BLACKOUTS
Available in luminous finish to reflect with light and glow without light —a recent foreign development.

"REFLECTO-CHAIN" is meeting the emergency created by steel shortages. Easily attached to Wood or Plywood as well as steel. Flexible as a string . . . any size or style of letter, figure or symbol can be easily formed and mounted on used or new materials. Quick, simple, inexpensive. Many different treatments possible (see illustration). Write for descriptive literature and prices Reflecto-Chain and also Pavement Markers. Send for trial shipment today.

Manufactured under U.S. Pat. Nos. 2,240,777; 2,113,759.

STAR-LITE
THE STAR-LITE CO.
312 EAST MARKET STREET
INDIANAPOLIS, INDIANA

Washington University, Maryland. Captain Heck was cited for work in many fields of geophysics, particularly in the field of earthquake research.

ALBERT SMITH, district manager for the Northern States Power Co., of Chippewa Falls, Wis., was elected chairman of the commercial division of the gas section at a recent convention of the Wisconsin Utilities Association in Milwaukee. E. C. Hemes, of the Milwaukee Gas Light Co., was made chairman of the technical division, with Carl A. Altenbern, general manager of the Wisconsin Southern Gas Co., Burlington, Wis., as vice chairman.

THE 24TH ANNUAL meeting of the American Zinc Institute will be held on Monday and Tuesday, April 20 and 21, at the Chase Hotel in St. Louis, Mo. Representatives of government agencies dealing with this vital war metal will participate.

THE BUFFALO SECTION of the American Society of Civil Engineers met with the Niagara Peninsula Branch of the Engineering Institute of Canada recently at Fort Erie, N. Y. Speakers included Maj. Frank Milligan, engineer of Military District 2, Toronto, Canada.

THE SOUTHEASTERN IOWA ENGINEERING SOCIETY in a recently-passed resolution voted to continue monthly meetings as long as rubber tires of members hold out.

THE SIXTEENTH annual conference of the Maryland-Delaware Water and Sewerage Association will be held in the Alexander Hotel at Hagerstown, Md., May 7 and 8. The group will discuss new ideas in water-works protection and service, as well as normal convention topics.

LOCAL committees have been appointed to care for members of the Southeastern Section of the Society for the Promotion of Engineering Education, who will gather at North Carolina State College, Raleigh, May 1, and Duke University, Durham, May 2, for annual sessions. Dean Blake R. Van-Leer, head of the State College School of Engineering, is in charge of arrangements. The general committee at State College is headed by Col. J. W. Harellson, dean of administration; and includes Dr. H. A. Fisher, and Prof. H. B. Briggs. At Duke, Dean W. H. Hall of the Engineering School is chairman, heading a committee which includes Prof. R. S. Wilbur, Prof. W. J. Seeley and Prof. H. C. Bird, all of the engineering school. Edward W. Ruggles is in charge of registration at State College.

MEN AND JOBS

James S. Lamb, North Dakota state highway commissioner, has been reappointed to his post, for a three-year term.

B. J. Ornburn, bridge design engineer for the Montana state highway commission, at Helena, has resigned to accept a post with the engineering department of the Northern Pacific Railroad Company at Seattle.

George N. Shaw has been appointed city manager of Coral Gables, Fla., to fill the post vacated by **A. B. Curry,** who recently became city manager of Miami.

Hugh A. Kelly, engineer and architect of Jersey City, N. J., has been appointed a Lt. Col. in the Corps of Engineers and assigned to the Office of the District Engineer at Baltimore, Md.

Ted M. Moody, assistant engineer in the Dallas, Tex., city public works department, recently was commissioned a lieutenant in the Corps of Engineers.

Capt. John H. McGavock, U. S. Army Area engineer at Nashville, Tenn., will represent the army in supervision of the construction of a $5,000,000, 1520-bed army hospital at Swannanoa. Assisting him will be Howard Churchill, architect and Robert H. Petty and N. H. Hickerson, engineers.

Dale Kenaston, resident engineer with the South Dakota State Highway Commission, has resigned to accept a post with the Northwestern Engineering Co. at Rapid City, S. D.

Howard I. Gorst, assistant city engineer at Bremerton, Wash., has resigned to join the Bremerton Housing Authority.

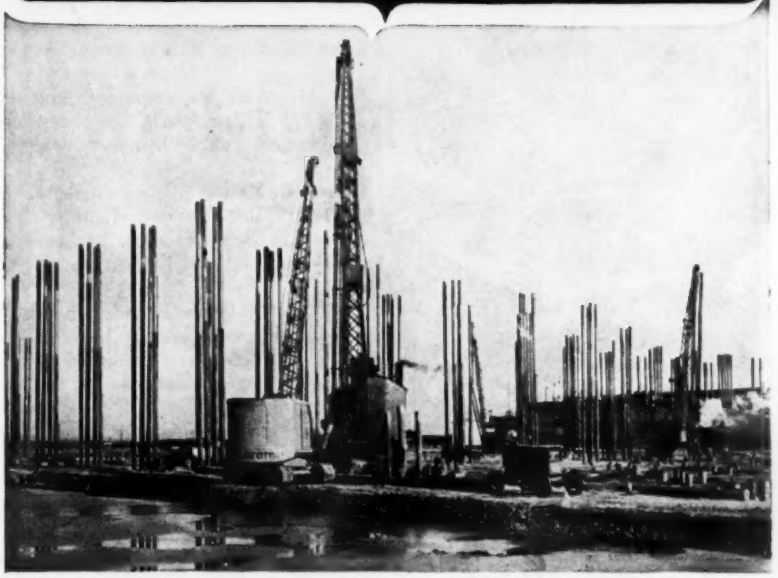
John W. Wright, location engineer with the South Dakota State Highway Commission, recently resigned to become assistant project engineer with the Corps of Engineers at Provo, S. D.

Maj. C. L. Bucknum, recently in charge of the construction of an army camp near Charlotte, N. C., has been transferred to New Jersey.

Lt. Col. S. D. Sturgis, Jr., district engineer for the Corps of Engineers at Vicksburg, Miss., has been promoted to the rank of colonel. **Maj. George Morris,** also of the Vicksburg office, was promoted to the rank of lieutenant colonel.

John MacVicar, head of the Municipal Engineering Co. of Des Moines and three

These Foundation Piles SPEED War-time Construction



Forty-five miles of ARMCO *Foundation Piles were used to support 500 building footings on this defense project. The 100-foot average lengths were supplied in 50-foot sections and joined by welding. A 5,000-pound hammer drove more than 2,300 piles into the hardpan.*

Speed and more speed is the cry on war-time construction projects. One way to push "Father Time" is to specify ARMCO Spiral Welded Piles for foundation work. They help you do the job with dispatch, economy and efficiency.

Once work is started there are no delays for lack of piles. Production schedules and deliveries see to that. Just as important, you can use ARMCO Piles on your toughest foundations. "Spiral Welded" is known for its strength, straight driving, water-tightness, and a uniformity of diameter that permits full salvage of cut-off pieces. All this saves time and money.

By using ARMCO Foundation Piles you can order any specified length (not random) that can be handled and shipped. Diameters range from 6 to 36 inches. When required, end plates, cone points or cutting shoes can be attached at the pipe mill. Write us for quotations and shipping promises. The American Rolling Mill Company, Pipe Sales Division, 1391 Curtis St., Middletown, Ohio.

ARMCO

SPIRAL WELDED FOUNDATION PILES

times street commissioner for the city, has been elected mayor. Street Commissioner **John Budd**, former city engineer, was reelected.

Charles E. Waddell, Asheville, N. C., civil engineer, has been retained by the government to do engineering work on a new Army hospital being built near Swannanoa.

M. A. Halvorson, who has been district roadside development engineer for the Iowa State Highway Commission, Mason City, has resigned to join the G. H. Lowe Co., Cedar Rapids, Iowa.

Maj. Harry R. Schupper, area engineer at Walla Walla, Wash., has been promoted to the rank of lieutenant colonel.

Damon E. Matter, resident engineer with the South Dakota State Highway Commission at Belle Fourche, has resigned to join the Corps of Engineers.

Ford L. Wilkinson, dean of the Speed Scientific School of the University of Louisville, has been appointed by the U. S. Office of Education to make a study of enrollment in engineering schools with a view toward encouraging larger graduating classes.

D. W. Peffer has been appointed borough engineer of Hellertown, Pa.

Clarence R. Beck, engineer of the Harrisburg, Pa. City Park Department, has been promoted to acting chief engineer of the department.

J. Godfrey Dreka has resigned as county manager for Volusia, Fla., to accept an engineering position with an aircraft company at Deland, Fla.

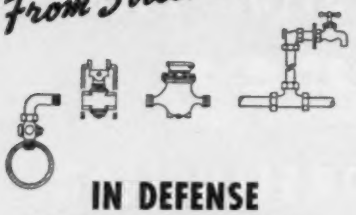
Lt. Daniel E. McDonald of Olivia, N. C., assigned to the area engineer's office at Camp Gordon, Ga., has been promoted to the rank of captain.

Charles A. Cannon of Kannopolis, N. C., has been appointed a member of the North Carolina State Highway and Public Works Commission, succeeding Thomas R. Wolfe of Albemarle, who resigned recently to become a lieutenant-colonel in the U. S. Army.

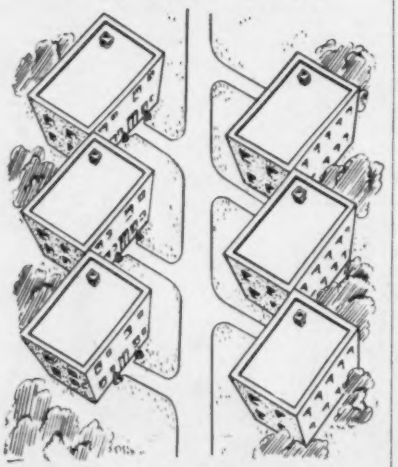
Edward F. Ferguson, chief engineer and general manager of the Gustav Hirsch Organization, consulting engineers of Columbus, Ohio, has entered the U. S. Army as a First Lieutenant in the Signal Corps. Lt. Ferguson has been associated with the organization since 1924.

Brig. Gen. Charles E. Sturdevant, assistant chief of United States Engineers, was made honorary colonel for life in the

"From Street to Bath"



IN DEFENSE HOUSING PROJECTS



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ENGINEERS, contractors and sub-contractors on defense housing jobs can fill their requirements for underground installations and inside fittings for water and gas lines at Hays. Regardless of the type of pipe to be used, Hays' complete line insures the availability of the correct style of fittings.

Hays water and gas fittings are already approved for defense housing projects—they have been used to complete satisfaction on many of the country's largest projects. Hays' modern plant with its own foundry, finishing and testing facilities, can supply fittings in large quantities on *time*.

Hays' wide practical experience in supplying goods for defense housing projects, can often be helpful in solving similar problems. On your next housing job, get a quotation from Hays. Hays products are handled by jobbers in all parts of the country.

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HAYS MFG. CO., ERIE, PA.

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BRASS • IRON
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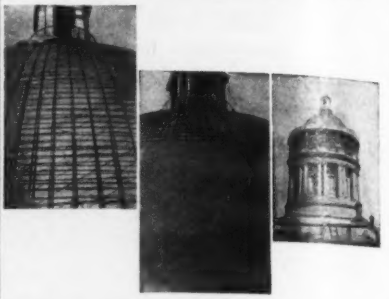
CAPITOL IN KENTUCKY



This State House dome, formerly wood, tin covered, now is a self-supporting structure of reinforced "GUNITE," 3" thick, that will endure as long as the building under it. The cost was relatively low, too!

Reinforced "GUNITE" is adapted to any type of building construction, new or for reconditioning. Architects, engineers and contractors are invited to send for a copy of our Bulletin 2200, which contains much valuable information.

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Manufacturers of the "CEMENT GUN"
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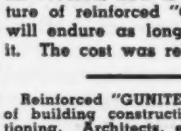
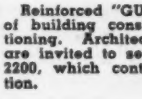
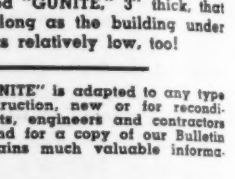
LET US BID ON YOUR WORK





KEEP YOUR CONVEYOR BELTS GOING



FLEXCO H D RIP PLATES are used in repairing rips and patching conveyor belts. Their use saves expensive replacements and extended shutdowns.

FLEXCO H D BELT FASTENERS make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

● Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco belt fasteners. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco. Also illustrates step by step the latest practice in repairing rips and putting in patches.

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FLEXCO H D BELT FASTENERS
Sold by supply houses everywhere

41st Regiment of Engineers, in a ceremony held recently at Fort Bragg, N. C.

M. C. Shibley, division engineer for the Oklahoma State Highway Department, has been appointed consulting engineer for Tulsa County's access road program.

Philip McKnight, of Topeka, Kans., has been appointed executive secretary of the Kansas State Highway Department.

H. J. Young, formerly Nebraska district engineer for the Portland Cement Association, has purchased a partnership in the Wahoo Concrete Products Co. at Wahoo, Nebr.

Col. Reading Wilkinson, U. S. engineer for the Charleston, S. C. district for the last four years, has been transferred to duty at Fort Jackson at Columbia, S. C. He is succeeded at Charleston by Lt Col. David Wood Griffiths, formerly of Galveston, Texas.

C. V. Johnson, senior engineer for the public roads administration at Lincoln, Nebr., has been ordered to active service with the U. S. Army with the rank of Lieutenant Colonel.

Ed Knapp, county engineer for Gove County, Kans., has resigned to accept a similar post with Smith County, making headquarters at Smith Center.

A. A. Baustian, formerly district engineer at Ames, Ia., for the Iowa Highway Commission, has been granted a leave of absence to join the Corps of Engineers with the rank of Major.

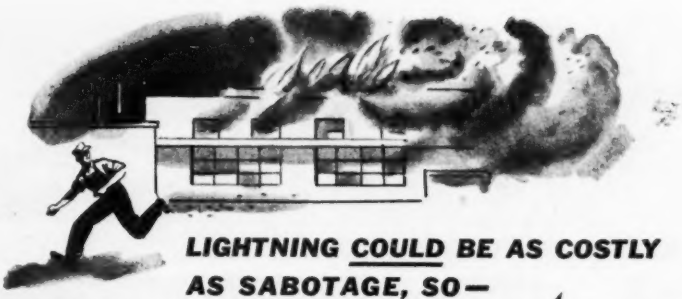
Anson Marston, dean emeritus of engineering at Iowa State College, was honored recently by a "Golden Jubilee Banquet" attended by 150 civil engineering students and faculty members. Dean Marston has served the school, at Ames, for fifty years.

Lewis E. Burnside, who resigned recently as city engineer of Sharon, Pa., has been commissioned a colonel in the corps of engineers, with headquarters at Pittsburgh, Pa.

L. L. Flint, secretary of the Iowa Engineering Society, of Des Moines, has been commissioned a Major in the Corps of Engineers and will be assigned to duty at Amboy, Ill.

W. M. Alsin, Des Moines, Ia., assistant district engineer of the Portland Cement Association, has received a Major's commission in the Corps of Engineers and will report at Bettendorf, Ia.

H. E. Palmer, of Wadena, Minn., has been named Dakota county engineer.



LIGHTNING COULD BE AS COSTLY AS SABOTAGE, SO—

★West Dodd Lightning Protection and static control equipment is standing guard over many plants vital to the nation's war effort, providing protection against something that could be as costly as sabotage. Over ammunition loading lines, over powder igloos and on shell loading plants. Over power stacks, and often the factories, where fighting tools are being forged.

Many items of West Dodd materials have been specially designed to meet U.S. Government specifications and requirements. Inspected and labeled in the plant by Underwriters' Laboratories. Approved by American Institute of Electrical Engineers.

Prompt delivery and complete cooperation on the job have earned for West Dodd commendations like that of W. W. Clark, President of The Dingle-Clark Company, contracting engineers of Cleveland, who writes: "—I really feel that we, as a company, performed a real service to the country in the operations we carried on at ——— Arsenal. Your cooperation with us played an important part in our ability to furnish vital parts of this job on time..."

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Factory fabricated for speedy, bolt-together erection. This characteristic of Butler Steel Buildings is now of prime importance throughout industry. Particularly is this so in the No. 1 war industry—mining, where swift expansion of facilities is needed to produce the gigantic increased tonnages of raw materials vital for victory.

Next in importance is adaptability. At the Evergreen Mine pictured here 11 operations are housed in Butler Steel Buildings ranging from fan rooms to locomotive round house in the top picture—and from ore bin, conveyor boot to washing plant shown at left. Structurally strong, fire-safe Butler Steel Buildings serve permanently or they are quickly enlarged, taken down and re-erected with full salvage.

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NEW PUBLICATIONS

(*Continued from p.* 104)

and bituminous road surfaces has just been issued by the Kotal Co.—*Kotal Co., 52 Vanderbilt Ave., New York, N. Y.*

Clamps—A leaflet, No. 46, describing the new Williams "Simplex" Clamp for positive disconnection back from wall surface is now available.—*Williams Form Engineering Corp., Grand Rapids, Mich.*

Excavators—The Harnischfeger Corp. has issued a bulletin on a new 1½-yd. P&H Model 655-A excavator, showing each feature of construction from crawlers to boom point sheave, bearing heavily on performance and durability.—*Harnischfeger Corp., Milwaukee, Wis.*

Heat Controllers—Describing the various applications of Micromax temperature controls for superheated steam, a new catalog contains diagrams showing construction and operation of the controls.—*Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia, Pa.*

Paving—"The Fastest Method of Low-Cost Paving" is the title of a new 12-page, two-color bulletin detailing the construction and operation of the Wood Roadmixer. This bulletin outlines the Roadmixer traveling plant method of low-cost, rapid construction of asphaltic mats and stabilized bases.—*Wood Mfg. Co., 208 W. 8th St., Los Angeles, Calif.*

Air Compressors—A handsomely illustrated catalog listing the various types of air compressors produced by the company, has been issued by Schramm Inc. This bulletin includes detail drawings of the machines, as well as charts and ordering specifications.—*Schramm Inc., West Chester, Pa.*

Concrete—An illustrated booklet showing applications of reinforced Gunite to almost any part of construction work has been issued by the Pressure Concrete Co. The booklet shows use of the product for repair of concrete buildings, for construction of new ones, use on reservoirs and seawalls, bridges and other places.—*The Pressure Concrete Co., Newark, N. J.*

Cranes—Just off the press is a new 6-page illustrated booklet on the new Model HC-70 truck-mounted crane—a highly mobile and versatile machine. The crane can be used with hook block, clamshell bucket, or a dragline bucket, and is recommended for wrecking operations, steel erection, excavating, material handling, road maintenance, etc. Brief specifications, clearance dimensions and

lifting capacities are given.—*Link-Belt Speeder Corp., 307 N. Michigan Ave., Chicago, Ill.*

Pumps—The features of Class GT two-stage centrifugal pumps are well illustrated in a new 12-page, two-color bulletin announced by Ingersoll-Rand Co. This bulletin contains 28 photographs and cross sectional views, extensive performance tables, and a comprehensive tabulation showing friction of water in various sizes of pipe. In addition, the text matter describes many structural details of the pumps.—*Ingersoll-Rand Co., 11 Broadway, New York, N. Y.*

Welding—A four page technical bulletin, No. T300, describing the new "Revers-O-Charge" capacitor weld units, has been released by Weltronic Corp. The bulletin explains the operation of several new features and presents a schematic diagram of the new condenser discharge circuit.—*Weltronic Corp., Detroit, Mich.*

Power Cutters—A spectacular illustrated booklet showing the many and varied uses of Doall contour machines for band sawing, band filing and polishing, is presented by the company. The booklet is entirely composed of pictures.—*Continental Machines, Inc., Minneapolis, Minn.*

Law—If your company is doing work outside of the state in which it was organized or if you follow construction and may at some time be interested in work outside your home state, you will find the pamphlet "Contracts You Can't Enforce" of interest and possible future value. The pamphlet discusses the necessity of qualifying for work in other states and describes a service to protect contractors against laws and regulations wherever their work may be.—*The Corporation Trust Co., 120 Broadway, New York.*

Indicators—A new bulletin, presenting the complete line of Foxboro potentiometer temperature indicators and indicating resistance thermometers has just been issued by the company. The instruments illustrated and described include single-point and multiple-point models, models equipped with selective key switches for as many as 82 contact points, as well as popular portable models.—*The Foxboro Co., Foxboro, Mass.*

Paper—The Dennison Manufacturing Co. has issued a new folder called "Paper Products for War Contracts," illustrating and describing many paper uses to aid contractors and engineers in filling war contracts. The folder also gives thumbnail descriptions of Dennison's basic

job experience *eliminates* costly experiments

The "on-the-job" experience of Twin Disc Clutch Company's staff of field engineers combined with competent factory engineering design eliminates costly, time-consuming experiments with untried designs, untested ideas . . . that's why we believe "job experience" is one of the most valuable assets a clutch specialist has to offer the builder of material handling equipment or heavy-duty road machinery.

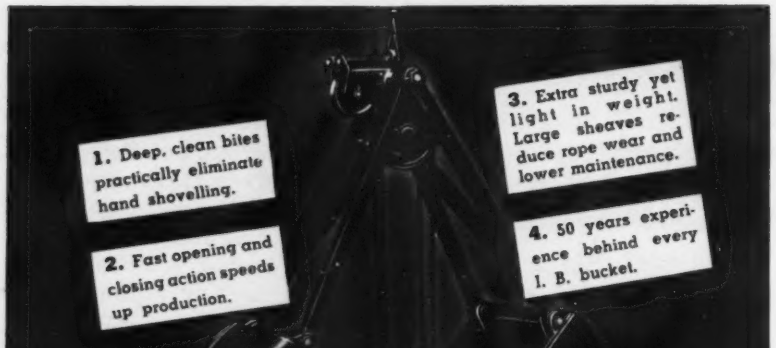
The Twin Disc Clutch Company's Engineering Department is ready to share their 24 years of experience in building *clutches to fit the job* with any material handling equipment manufacturer or builder of heavy-duty road machinery who has a clutch problem. Write Engineering Department, TWIN DISC CLUTCH COMPANY, 1327 Racine Street, Racine, Wisconsin.

LEFT: *Heavy-duty, enclosed-type Model E Twin Disc Clutches are available in sizes from 14" to 42", in single or two-plate assemblies.*

CENTER: *Twin Disc Power Take-offs are suitable for engines having up to 285 hp. output.*

BOTTOM: *This paver, manufactured by the Flexible Road Joint Machine Co., Warren, Ohio, is equipped with a Twin Disc Power Take-off.*

5 REASONS WHY PRODUCTION-MINDED MANUFACTURERS DEMAND I. B. BUCKETS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DAVENPORT LOCOMOTIVE WORKS

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paper converting facilities through suggesting other paper items the company can produce.—*Dennison Manufacturing Co., Framingham, Mass.*

Tractors—A booklet called "The Reporter," issued by the Allis-Chalmers Mfg. Co. for its dealers, has just been made available. Devoting itself particularly to the care and maintenance of tractors and their equipment, the booklet demonstrates many uses of the tractors throughout the United States and Canada.—*Allis-Chalmers Mfg. Co., Milwaukee, Wis.*

For victory—The "Production for Victory" edition of U. S. Steel News, recently published, disclosed an unprecedented number of production records attained by subsidiaries of the Corporation. Sections of the Victory number are devoted to the wartime problems of safeguarding production and first aid training. Portraying the active part taken by employees in production for victory, the magazine also contains articles describing the voluntary leisure time activity of the corporation's employees. Four pages are devoted to government bond sales campaigns under the title "The Bond Wagon's Rolling."—*United States Steel Corp., 71 Broadway, New York.*

Pavers—A new catalog descriptive of the 1942 Rex 34E paver, a two compartment paver with capacity of 34 cu.ft. of concrete, has just been released. The catalog shows that incorporated in the operation of this paver is the Rex mechanical man which controls charging, discharging and mixing operations automatically.—*The Chain Belt Co., Milwaukee, Wis.*

Flooring—The Josam Manufacturing Co. has announced the completion of an authoritative specification manual containing roughing-in-measurements of many Josam products. The manual contains valuable information, edited for the engineer, plumbing contractor, and architect for the selection or installation of roof, floor and shower drains, grease and oil interceptors, sewer valves, swimming pool equipment and similar plumbing and drainage items. The products are illustrated and the typical specifications so arranged as to make it possible to locate any item instantly.—*Josam Manufacturing Co., Cleveland, Ohio.*

Brushes—Catalog K-15 of Keystone carbon, graphite and metal-graphite brushes has been issued by the Keystone Carbon Co., Inc. Popular types of Keystone metal-graphite brushes for low-voltage generators and slip ring applications, and carbon-graphite brushes, for motors and generators, are illus-

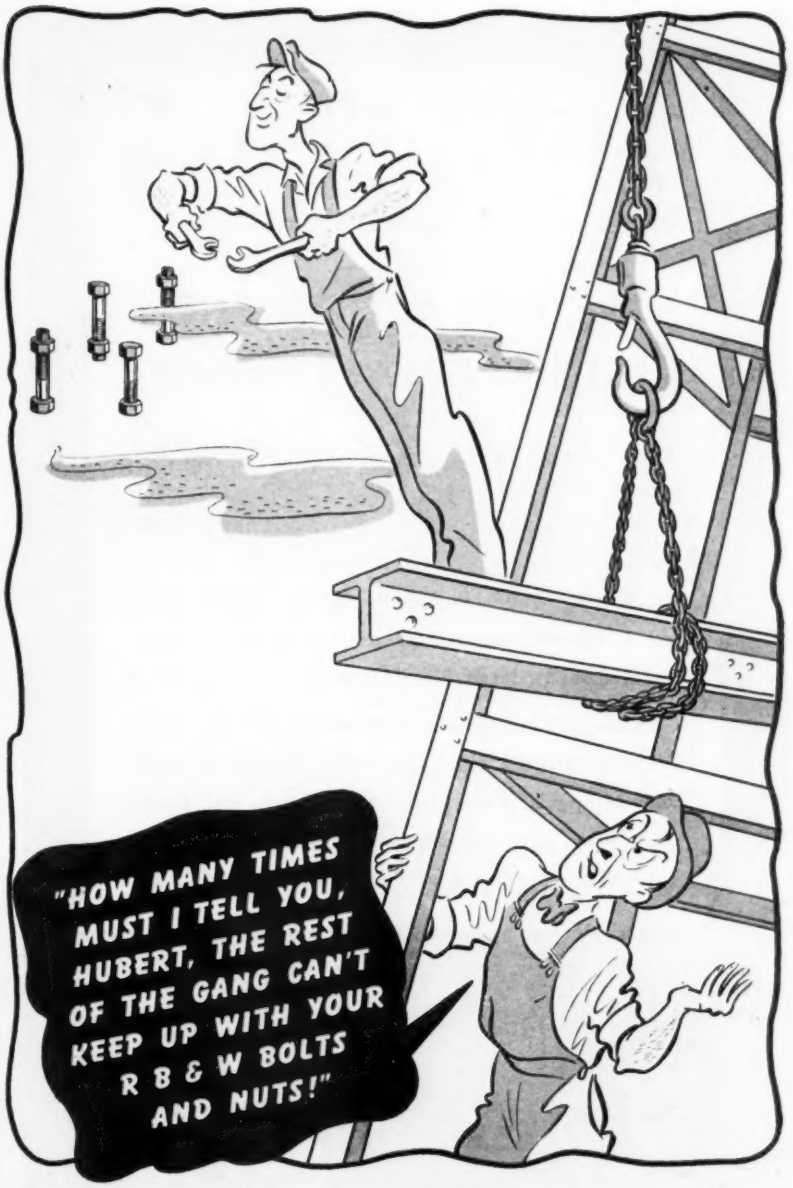
trated. Also shown are fractional horsepower and automotive brushes, as well as metal graphite and carbon contacts, negative temperature co-efficient resistors, and Selflube porous bronze and porous iron bearings. The catalog contains base prices of standard sizes of brushes and gives a simple method for computing prices for each style.—*The Keystone Carbon Co., Inc., 1935 State St., St. Marys, Pa.*

Redwood—The overall story of how, where and why versatile California Redwood is helping the army, navy, and industry solve current emergency problems is told by pictorial illustrations and informative captions in an 8-page bulletin titled "Stepping Up War Production with Redwood." Prepared specifically for engineers and architects, the bulletin tells how redwood replaces scarce metals and restricted materials and is performing important services on defense highway bridges, hangars, army water tanks and other structures.—*California Redwood Association, 405 Montgomery St., San Francisco, Cal.*

War Production—A booklet called "How One Company Tackles the War Production Problem", an actual case history of how one American manufacturing concern planned and executed a plan to obtain prime contracts and sub-contracts, in order to keep business going, has been issued by the Lyon Metal Products, Inc. The book is a step by step treatment of how this company set about to regain lost production. The book is packed with suggestions for every manufacturer, large or small. It deals particularly with the company's own war production board, a committee which meets every day to coordinate all divisions of the business on this one all-important problem of identifying the company with the war picture.—*Lyon Metal Products, Inc., 3213 Clark St., Aurora, Ill.*

Air Conditioners—A new bulletin G-2 has been issued by the Air and Refrigeration Corp., describing the capillary cell and its application in air conditioning equipment as a direct heat transfer surface between water and air. The book outlines the functions of the cells for cooling and dehumidifying, humidifying, air cleaning, evaporative cooling, condenser water cooling, fume absorption, etc. Engineering and performance data are presented in convenient tabular and graphic form.—*Air and Refrigeration Corp., 475 Fifth Ave., New York, N. Y.*

Dozer—The 1942 combined dozer broadside and poster, Form A-278, is now available from the R. G. LeTourneau, Inc. The broadside explains the



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Quick-starting, quick-tightening because they are accurately, uniformly sized and threaded — and carefully inspected.

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Russell, Burdsall & Ward Bolt and Nut Company. *Factories at* Port Chester, N. Y., Rock Falls, Ill., Coraopolis, Pa.; *sales offices at* Philadelphia, Chicago, Detroit, Chattanooga, Los Angeles, San Francisco, Portland, Seattle

DEFENSE BULLETIN

WE ARE ALL ON THE FIRING LINE · · · — NOW!

This war will be won by the "all out" teamwork of the men who fight and the men who work. Every product we produce for National defense has a direct bearing on victory. It may be hose for a navy yard on the Pacific, or rubber parts for a Detroit sub-contractor working on tanks, or airplane orders from Buffalo.

Continental customers well understand that their "civilian" needs must take second place to their war demands. Thus those who work, and those who wait, are also on "the firing line" in this fight which must not fail for the freedom of us all.

From Factory Bulletin Board of the
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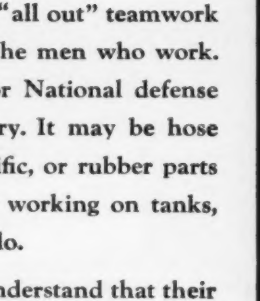
MAKERS OF THE VITALIC LINE OF TIRE TUBES
ERIE, PA., U.S.A.



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main construction features of the LeTourneau dozer and pictures it in operation on various types of jobs and under various working conditions. The broadside opens into a 24x36 in. poster showing the four types of LeTourneau dozers available and gives condensed specifications on each model.—*R. G. LeTourneau, Inc., Peoria, Ill.*

Nickel—A spring edition of "Inco" magazine, published by the International Nickel Co., Inc., makes an effort to treat helpfully present-day problems such as salvage of scrap, subcontracts, and the conservation of supplies. Of notable interest is the story on the development of the new type of rivet which eliminates blind fastening. Other features recite the part which nickel and nickel alloys play in the production of essential wartime material, including tungsten and plastics used in the construction of military and naval airplanes.—*The International Nickel Co., Inc., 67 Wall St., New York, N. Y.*

Tractors—The Caterpillar Tractor Co. has just released a new yearbook, called "The Year 1941," telling the complete story of the company's activities for the past year in words, figures and pictures.—*Caterpillar Tractor Co., Peoria, Ill.*

Clay Pipe—Three recent publications of the Clay Sewer Pipe Association, Inc., are now available. The folders describe extra strength clay sewer pipe, a relatively new product, which is said to be of particular value in connection with the current effort to conserve metal, since it performs a service which formerly required metal in various forms and quantities. Perforated clay sewer pipe, also a relatively new item, is of importance in the present program of extension of air fields and military roadways.—*Clay Sewer Pipe Association, Inc., 947 Oliver Building, Pittsburgh, Pa.*

Materials Handling—A new 12 page illustrated folder, No. A-282, is now available showing the complete line of LeTourneau mining and materials handling tools. Modern methods and equipment for increased production is explained.—*R. G. LeTourneau, Inc., Peoria, Ill.*

War Production—A vest pocket size booklet has been issued by the E. F. Houghton & Co., under the title "War Production Data from The Houghton Line." The book gives details of some of the operations involved in producing war products and shows the activities of the company toward the war effort.—*E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia, Pa.*

Manufacturers' Activities

(*Continued from p. 97*)

JOSEPH T. WRIGHT has been appointed manager of the compressor and tool division of the Worthington Pump & Machinery Co., Harrison, N. J., at the company's Holyoke, Mass., works.

HOWARD COONLEY, chairman of the board of the WALWORTH CO., manufacturers of valves and fittings, has been appointed chief of the simplification branch of the Bureau of Industrial Conservation, War Production Board.

The NORTH AMERICAN CEMENT CORPORATION has announced the following new appointments; THOMAS J. HARTE, formerly vice-president in charge of sales has been made executive vice-president; EDWIN S. GUTH, formerly general plant manager, has been made vice-president in charge of operations; EDGAR K. MILLER, formerly auditor, has been made controller. The company also announced that effective June 15, 1942, its general offices will be located at the Columbian Carbon Building, 41 East 42nd street, New York, N. Y.

NEWTON D. BAKER, III, son of the late secretary of war, has joined the staff of the CLEVELAND GRAPHITE BRONZE CO. as special representative on Army and Navy contracts. Other changes in the company's organization include: L. W. CHRISTENSON appointed Western sales manager in charge of Detroit branch, and EDWIN CRANKSHAW, formerly of the engineering staff of the General Electric turbine gear division, placed in charge of mechanical division of the engineering department.

ROGER B. DAVIS, secretary-treasurer and general manager of the Lake County Gas Co., Willoughby, Ohio, has resigned to accept an executive post with DIAMOND MAGNESIUM CO., at Painesville, Ohio.

GEORGE SELL, former secretary and assistant general manager of the EMBRO MANUFACTURING CO., Canton, Ohio, has been named a contract specialist with the War Production Board's contract distribution office at Canton.

EDWARD T. FISHWICK, vice-president and director of the WORTHINGTON PUMP & MACHINERY CORP., Harrison, N. J., died March 15 at his home in Glen Ridge, N. J.

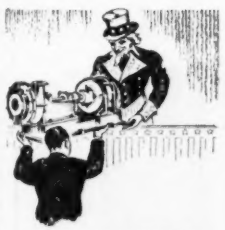
M. J. BEASLEY, formerly factory and sales manager in the Birmingham district for the SOUTHERN IRON ROOFING CO., has been elected a vice president of the company in charge of operations.

A VACUUM CLEANER FOR A RESERVOIR

This Morris Electric-driven Dredge is shown removing accumulations of silt and sediment from a reservoir . . . at a total cost of less than 10 cents per cubic yard! Municipalities and power companies all over the country use Morris Dredges for this purpose because of their economy, effectiveness, and ease of operation.

If your own water supply reservoir needs housecleaning, a Morris Hydraulic Dredge will do the job quicker and at less cost than by any other method. These dredges are built in portable types for easy transportation and assembly, and for operation by electric motor, Diesel or gasoline engine.

Write for full information



We have enlisted *"for the duration"*

We have placed at the disposal of the Government all our facilities that might be of use in the national war effort. But our remaining facilities are at your service, and also the advice of our engineers to help you secure best results from your present equipment and to plan for your future needs.

MORRIS MACHINE WORKS — MORRIS ESTABLISHED 1864 — BALDWINSVILLE NEW YORK

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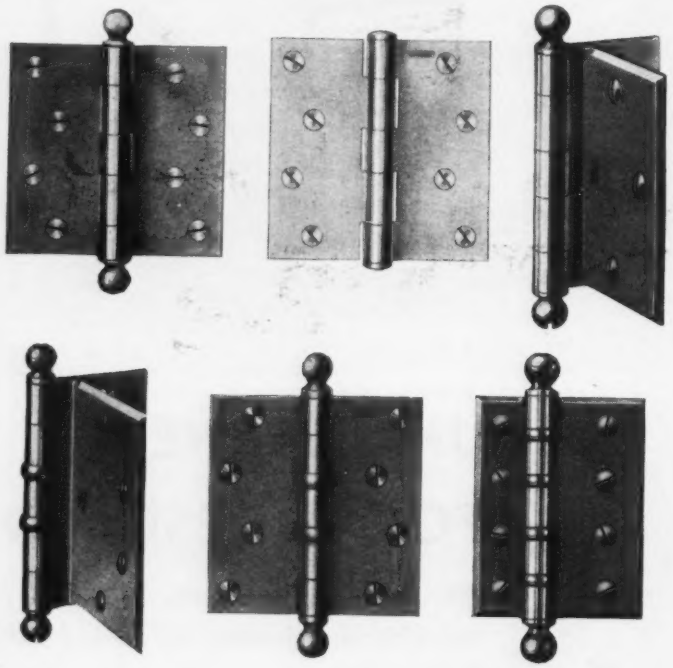
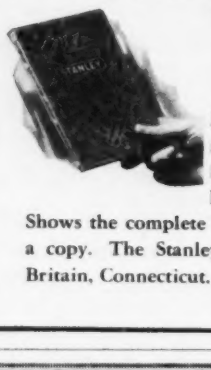
Look to STANLEY for BUTT HINGES

for every type and size of DOOR



SEND FOR COPY OF STANLEY HARDWARE CATALOG NO. 61



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"SHOOT IT WITH AIR"

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20 YEARS OF *EXPERIENCE*

★ ★ ★ ★

INDIANA GUNITE & CONSTRUCTION CO. Inc.

GENERAL CONTRACTORS AND ENGINEERS

INFORMATION—ESTIMATES

INDIANAPOLIS INDIANA

WILLIAM R. GIGNILLIAT, vice president of the SOUTHERN NATURAL GAS CO., of Birmingham, has resigned to join the U. S. Army aviation service, with the rank of major, and will be located at Maxwell Field, near Montgomery.

CLARENCE TOLAN, JR., president of the DODGE STEEL CO. of Philadelphia, and WILLIAM C. CARTER, executive vice president of the LINK-BELT CO., have been elected directors of the LINK-BELT CO., Chicago, Ill.

J. P. MCILHENNY has been appointed sales manager of the GENERAL ELECTRIC air conditioning and commercial refrigeration department, with headquarters at Bloomfield, N. J.

EUGENE J. STERN has resigned as vice president in charge of operations of the ATLANTA GAS LIGHT CO. and the FLORIDA PUBLIC UTILITIES CO., to accept the presidency of SCRIPTO MANUFACTURING CO., of Atlanta, manufacturers of pencils.

The SOUTHSIDE CONSTRUCTION CO., INC., Jacksonville, Fla., has just been chartered with N. C. EDWARDS, H. L. ANDERSON and C. V. WYSONG as directors.

The DOMINION CONSTRUCTION CO., LTD., Vancouver, B. C., has moved to new offices at 150 West First Ave., after 30 years in the old Canada Life Building.

KEY WEST BUILDERS, INC., contractors, have been chartered at Key West, Fla., with M. D. GALLOWAY, C. B. CLEVELAND, and C. R. CLARK as directors.

FRANK A. HITER, vice president and general sales manager of the STEWART-WARNER CORP., has recently been elected a director of the organization.

WALLACE K. BROWN has been appointed vice president in charge of procurement for the CROCKER WHEELER ELECTRIC MFG. CO. He will make his headquarters in the company's offices at Ampere, N. J.

ALFRED S. OTTON, advertising manager for the ROBINS CONVEYING BELT CO., has been relieved of his former duties to handle productive assignments in connection with war work now being done by the company. JOHN M. LUPTON, formerly assistant advertising manager, has been promoted to succeed Mr. Otton.

JOHN R. O'TOOLE, 34, southeastern manager for the AMERICAN STEEL & WIRE CORP., died at his home in Atlanta, Ga., April 6.

The MCKENNA METALS CO., manufacturers of Kennametal steel cutting car-

bide tools, announces the appointment of W. D. FISHER, of Detroit, as sales representative and tool engineer in the Detroit district. Mr. Fisher was formerly with the VANADIUM ALLOYS STEEL Co. at Detroit.

The METALLIZING COMPANY OF AMERICA announces the opening of new and larger offices and warehouses at 1330 West Congress St., Chicago.

FRANK M. WARREN, JR., formerly assistant to the president of the PORTLAND GENERAL ELECTRIC Co., has been appointed second vice president of the organization.

The LONE STAR STEEL Co., with a capital stock of $1,000,000, has been charted by the State of Texas. Organized to construct pig iron blast furnaces, the company's incorporators are JOHN W. CARPENTER, NATHAN ADAMS, CHARLES R. MOORE, W. W. LYNCH, E. B. GERMANY, R. L. THORNTON and FRED FLORENCE, all of Dallas, and W. O. IRWIN, of Daingerfield.

L. RUDY MARTIN, 40, sales manager of the NATIONAL SUPPLY Co., of Louisville, Ky., died April 7.

AARON THOMAS BOWERS, 55, superintendent of the READY-MIXED CONCRETE & SUPPLY Co., died at his home in Nashville, Tenn., April 6.

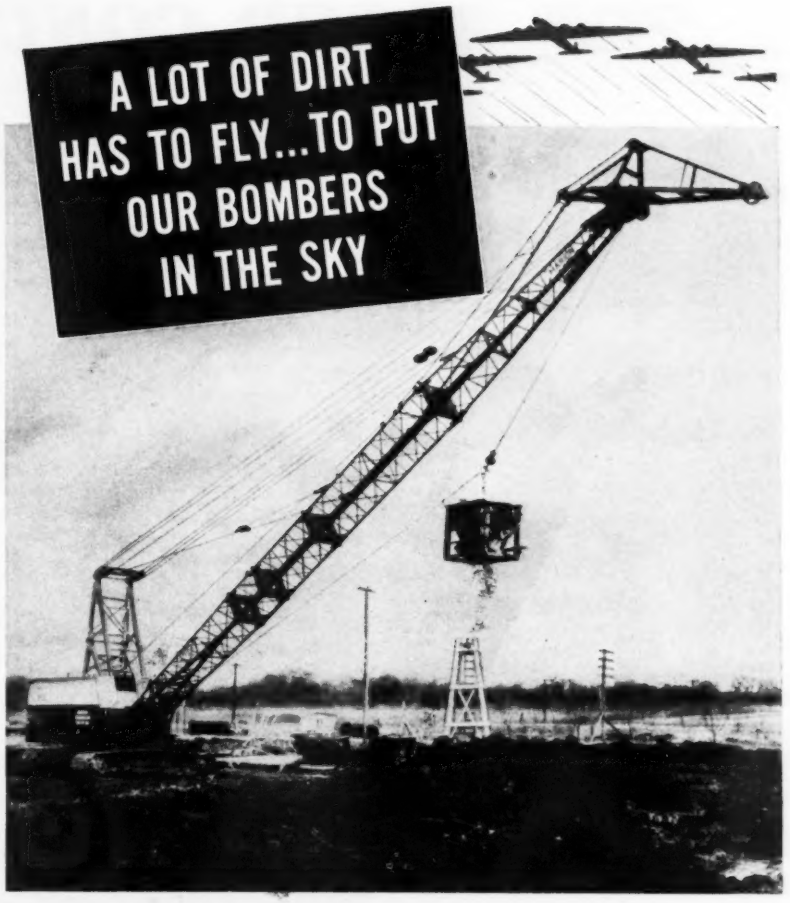
J. H. MATTHEWS, assistant general manager of the MANHATTAN RUBBER MFG. DIVISION, Passaic, N. J., and O. H. CILLEY, assistant general manager of the UNITED STATES ASBESTOS DIVISION, Manheim, Pa., have been elected directors of RAYBESTOS-MANHATTAN, INC.

RALPH C. CAMERON has been appointed regional sales supervisor for the northern region of the AIRTEMP Division of CHRYSLER CORP.—He succeeds JESSE E. HOYT, who will take over important government contracts at Wright Field.

WALTER LITTLE SMITH, formerly an engineer for the NORTH CAROLINA EQUIPMENT COMPANY, has been appointed assistant area engineer in the construction of the Volunteer Ordnance Works, near Chattanooga, Tenn.

RICHARD F. SENTNER, of Wheeling, W. Va., formerly manager of tin plate sales for the WHEELING STEEL CORPORATION, has been appointed head of the tin plate unit of the Iron and Steel Branch, War Production Board.

D. P. DOUGLAS CONSTRUCTION Co., INC., has been chartered at Panama City, Fla. D. P. Douglas, F. H. Pugh and V. Myers are listed as directors of the organization.



★ Where is this? What are they building—a new bomber plant? A big one? What type of bombers? Who's going to make 'em? How fast can they turn 'em out . . . .

That's your Uncle Sam's business! And his nephews aren't loose-lipped these days.

Being Uncle Sam's business, the contractors (mentioning no names, except to say they're smart operators) didn't lose any time on the job . . . .

There's nothing secret about this. The way to get a war construction job done right-on-schedule *or ahead of time* is to use Waukesha-Engine-powered equipment. That's what happened here—with this Marion Type 40-A Crane and its Model 6NKH 6-cyl., 7 x 8½ in., 1962 cu. in. displacement Waukesha-Hesselman Oil Engine.

The Hesselman starts as easily and quickly as a gasoline engine . . . burns high speed diesel fuels *and* domestic furnace oils 1, 2 or 3 smoothly. Its compression pressures are low; its electric ignition positive, and definitely timed. Its *explosion* pressures actually are *less than compression pressures* in a Diesel. This means that the strain on rods, heads, pistons, cylinders, gaskets and bearings is less.

Waukesha Engines stand up under round-the-clock seven-day-week operation. And still turn out full rated horsepower—with reserve power for the pinches.

For Industrial, Stationary, and Automotive Power—Waukesha Oil and Gasoline Engines range in size from 5 hp. to over 300 hp. *Get Bulletins 1079 and 1200.*

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN

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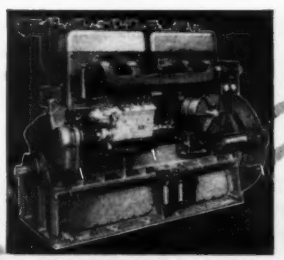

WAUKESHA ENGINES

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Use 'Incor'. . . strip forms in 24 hours . . . re-use forms 3 days sooner . . . top speed, 50% less forms. Heavy-duty floors, loading platforms, machinery bases, paving—poured today, ready for use tomorrow. Fast 'Incor' schedules mean better use of every man-hour . . . maximum construction efficiency. *Time won't wait . . . use 'Incor'!*

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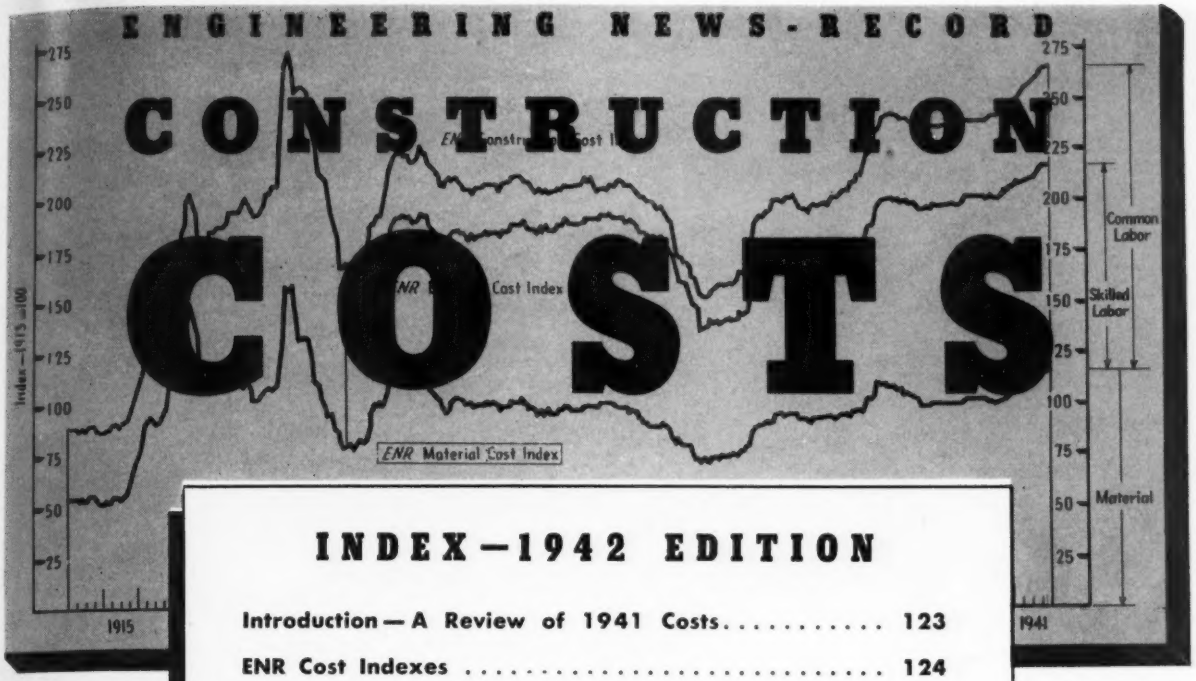
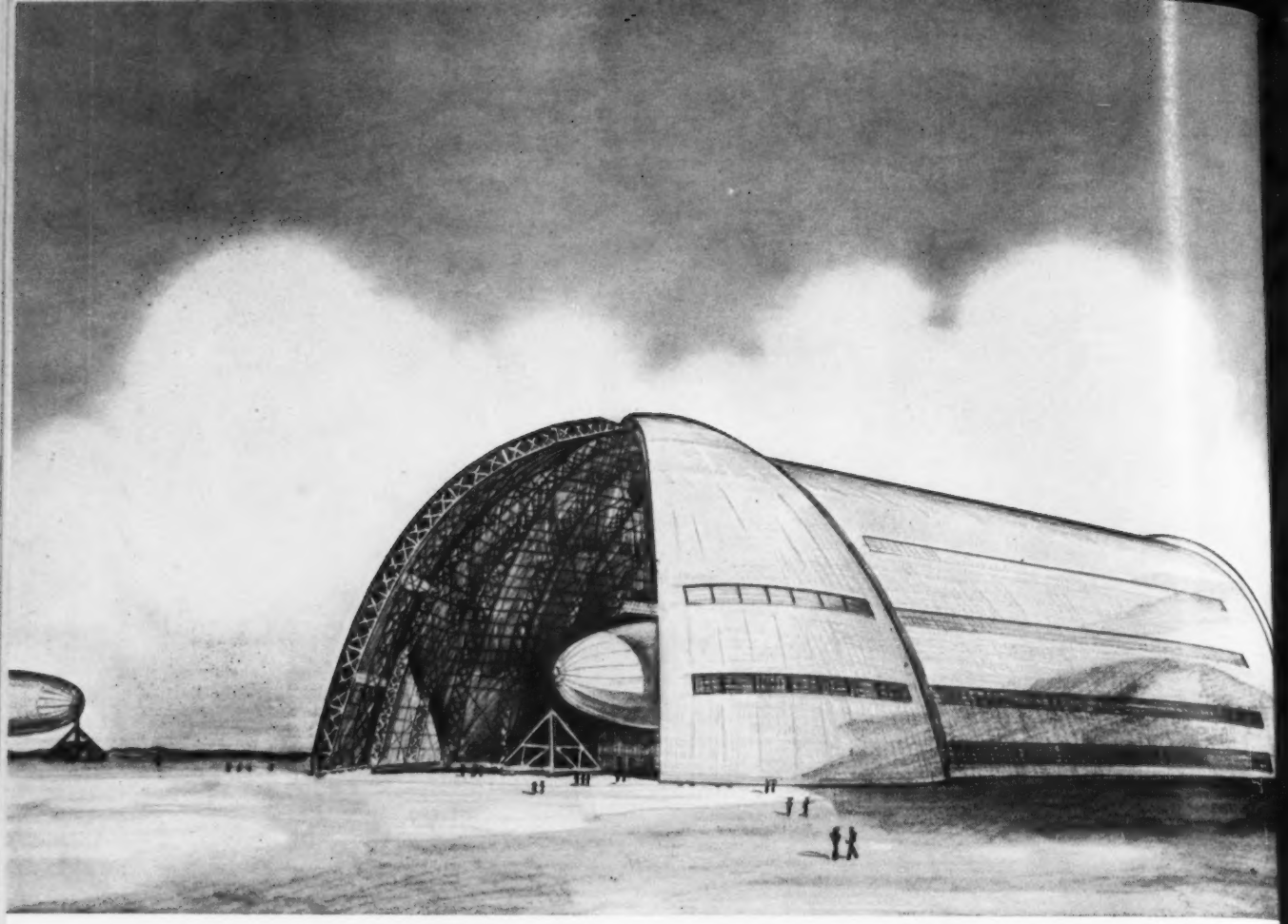


INDEX—1942 EDITION

Introduction—A Review of 1941 Costs 123
ENR Cost Indexes 124
Special Building Cost and Volume Indexes 126
Railroad Cost Index 130
Public Utility Construction Cost Index 132
Lambert's Utility Cost Trends 134
Boeckh Building Cost Index 138
Bond Interest and Money Rates 140
Keeping Costs with Tailor-Made Indexes 144
Compensation Insurance Rates 150
Prices of Construction Materials 153
Construction Wage Rates 164
Equipment Rental Rates 172
Roadbuilding Costs 174
Municipal Building Costs in New York City 176
Small House Costs 178
USHA Housing Cost Data 180
Building and Bidding a Lump-Sum Camp 182
Application of Cost Indexes 189
Contract Unit Bid Prices 191

Work data for engineers and contractors concerned with planning, estimating, bidding, appraisal and valuation



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Here are huge doors . . . weighing some six hundred tons per leaf . . . that provide openings approximately 340 feet wide and 190 feet high. By the simple throw of a switch the electrical operators furnished by Byrne will smoothly open or close these doors in five minutes. Byrne engineers collaborated in the design of this equipment.

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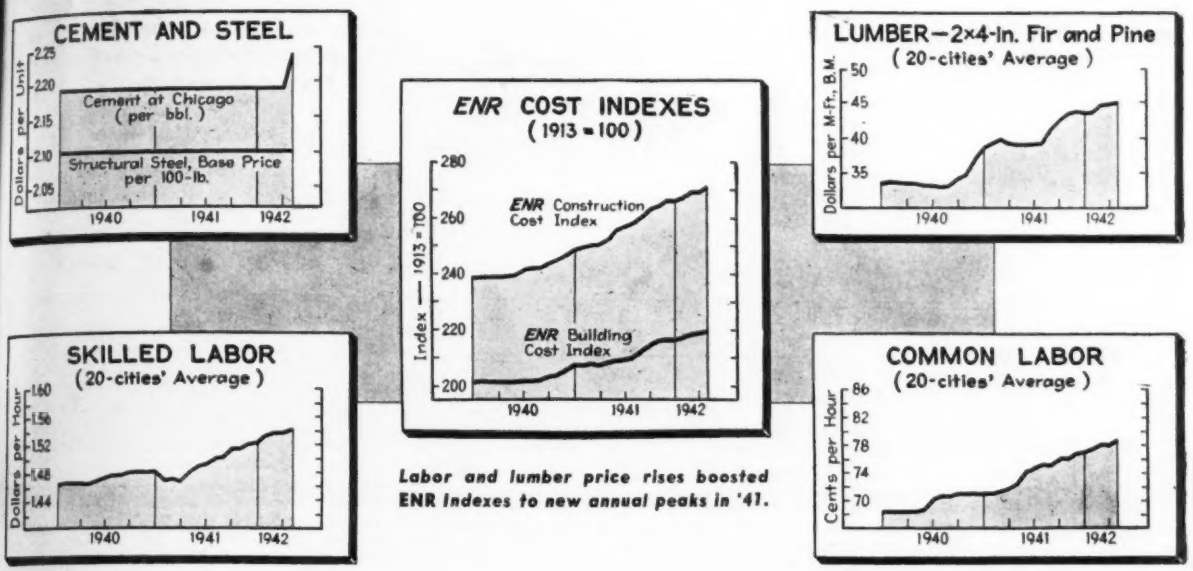
INTRODUCTION TO
CONSTRUCTION COSTS
1942 EDITION



Labor and lumber price rises boosted ENR Indexes to new annual peaks in '41.

CONSTRUCTION COSTS climbed steadily in 1941, mirroring, but to a lesser degree, the increases evident in other branches of the nation's economy. In the construction field, costs rose 7 percent during the year as a result of an 8 percent gain in the common labor component of the *ENR* Construction Cost Index and an 11 percent rise in the lumber component. Skilled labor increased 3.5 percent.

In manufacturing industries labor rates as reported by the National Industrial Conference Board, climbed at a faster pace, the skilled and semi-skilled wage increasing 9 percent, and common labor rising 10 percent. Wholesale prices of building materials gained 9 percent over the 1940 average, according to the Bureau of Labor Statistics, whereas farm products were up 22 percent; foods and textiles each climbed 16 percent; chemicals rose 10 percent; and the index for all commodities was 11 percent higher in 1941.

The *ENR* Construction Cost Index, based on material and labor price quotations, averaged 257.84 for 1941, the highest yearly value ever reported, and 2.5 percent above the previous peak, 1920. The top 1941 index value, 266.16 for December, however, was below the all-time high of 273.80, recorded in June, 1920.

In addition to the changes in the material and labor price quotations, measured by the *ENR* Construction Cost Index, other important but invisible factors cropped up during 1941 to plague contractors bidding on construction work. Shortages of skilled labor in some areas necessitated hiring men who did not measure up to the efficiency standard of their predecessors; the speed of the defense program increased the use of overtime work and consequently costs; longer distances to go for materials added freight costs; and delays in deliveries necessitated either a slowing down while waiting, or a substitution of other materials to complete the job. These invisibles added substantially to the obvious increases due to material and labor changes.

Willingness of builders to pay premiums to obtain scarce materials also played its part in boosting costs.

To ease the lot of contractors bidding on some of the larger projects, escalator clauses have been inserted in the specifications allowing for adjustments on the bid price in the event of material or labor price changes. Some of these clauses, which base their adjustments on Bureau of Labor statistics data on wages and prices, or other reputable indexes of a similar nature, have stipulated that differences are to be paid the contractor at specified periods, on a basis of labor approximating 30 to 35 percent of the cost, and materials 38 to 40 percent.

Construction costs have continued their upward trend in 1942, reaching 271.78 in April. Further increases in labor and lumber were responsible for the gains in the first three months, and cement added its bit during the current month.

With price ceilings set by the OPA on most of the major construction materials, no great material cost changes are anticipated. New building wage contracts coming up for renewal in several construction areas, however, have included requests for higher rates. Some of these increases have already been granted and will take effect in May or June unless the study being conducted by various government agencies results in the stabilization of wages at present levels.

ENR Construction Cost Index

THE ENGINEERING NEWS-RECORD Construction Cost Index has four components: (1) structural steel shapes, base price; (2) cement at Chicago; (3) lumber, which until 1935 was 12 x 12 long leaf yellow pine wholesale at New York, and since 1935 is 2 x 4 S4S pine and fir in carload lots, *ENR* 20-cities average; (4) common labor, *ENR* 20-cities average of wage rates in force.

The weighting for the original price series is given in the following computation for December, 1934:

Steel	25 cwt. x 1.80	= 45.00
Lumber	0.6 x 61.00	= 36.60
Cement	6 x 2.00	= 12.00
Labor	200 x .5413	= 108.26
Index		201.86

The weighting for the new lumber price series is 1.088, and the computation for January, 1942 index is:

Steel	25 cwt. x 2.0675	= 51.69
Lumber	1.088 x 43.75	= 47.60
Cement	6 x 2.19	= 13.14
Labor	200 x .776	= 155.20
Index		267.63

This Construction Cost Index is designed to predict changes in construction cost trends and to measure the movement of construction costs in general. It is not intended to apply to any specific class of construction or to a particular locality.

ENR Building Cost Index

In practice, the construction cost index has been used widely to apply

Engineering News-Record BUILDING Cost Index—1913 = 100

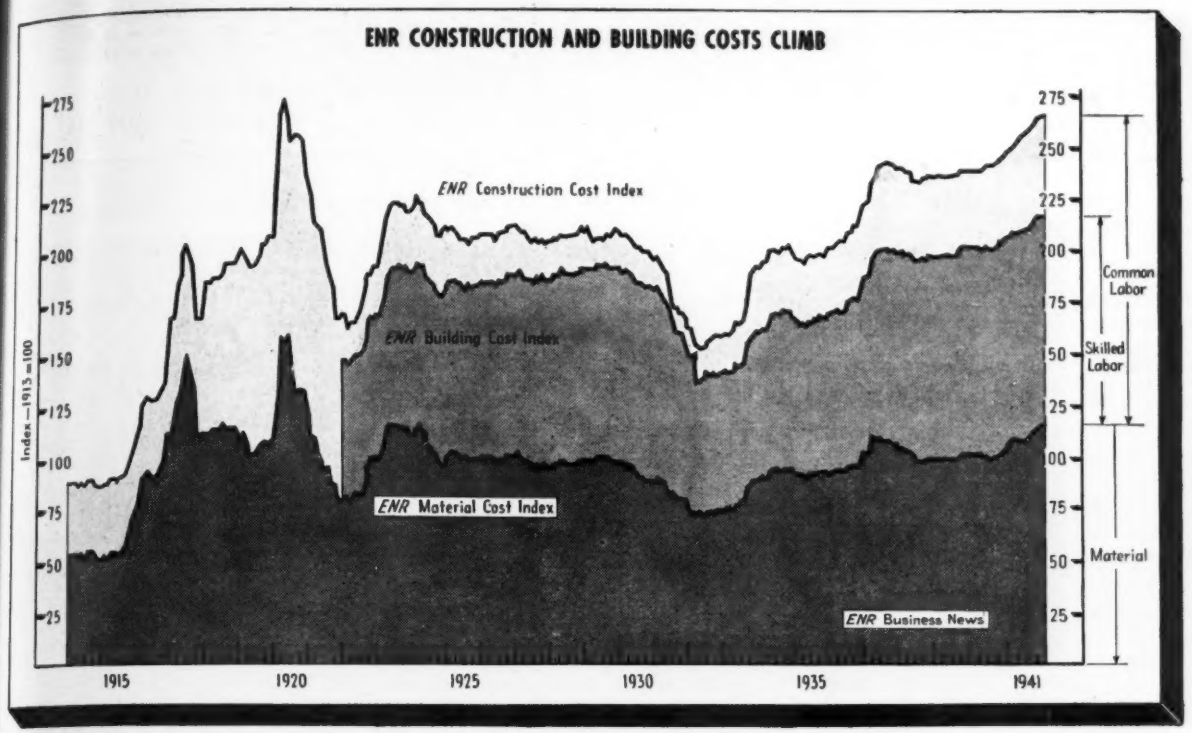
Yearly Aver. 1910 to 1922			1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†
1910....	96.4	J	147.1	168.2	189.3	182.7	184.3	187.8	185.9	190.0	190.3	180.7	150.6	140.8	160.2	166.5	168.3	185.5	198.6	196.2	201.5	207.9	217.1
1911....	94.1	F	146.5	172.6	191.7	184.5	183.7	189.2	187.2	190.0	188.5	182.0	147.2	141.7	161.3	165.8	168.4	186.6	199.0	196.2	201.5	208.4	218.4
1912....	91.4	M	145.2	178.4	194.1	184.5	184.3	187.3	187.2	190.0	189.2	180.2	145.9	140.8	161.7	164.1	169.7	187.7	199.3	196.5	201.5	207.9	218.9
1913....	100.0	A	147.1	186.0	191.8	184.7	184.1	186.0	188.8	190.0	188.8	177.6	135.7	141.5	163.2	164.4	170.0	195.0	198.2	196.5	201.4	208.6	219.6
1914....	91.9	M	149.0	188.9	192.5	182.8	183.6	185.4	190.1	191.3	187.9	174.6	136.4	143.9	168.2	163.3	170.3	197.2	197.9	196.6	201.2	209.2	.....
1915....	95.3	J	149.8	191.3	187.7	183.0	181.8	185.8	187.6	192.0	185.4	172.5	137.6	143.2	168.2	164.9	170.2	199.2	198.2	196.4	201.7	209.4	.....
1916....	130.9	J	150.9	191.4	184.5	180.2	184.3	183.9	187.6	192.0	183.3	170.5	139.5	144.3	169.2	165.3	170.9	199.8	194.4	196.8	201.7	210.2	.....
1917....	166.8	A	154.6	191.5	183.3	183.0	185.1	186.5	187.6	192.8	183.7	163.1	139.4	145.9	168.4	166.2	173.9	200.7	194.5	196.5	201.7	212.5	.....
1918....	159.1	S	164.2	192.2	181.4	180.5	185.1	184.6	187.6	191.6	182.4	159.5	139.6	154.5	170.1	166.1	174.3	200.6	194.8	196.6	203.1	214.6	.....
1919....	158.8	O	167.8	191.0	178.4	181.8	188.0	186.6	187.6	190.3	181.8	159.5	140.0	157.1	170.2	167.3	175.3	201.0	195.5	198.5	204.0	215.9	.....
1920....	207.2	N	167.1	192.4	176.5	182.4	188.0	185.0	188.0	190.3	181.8	158.3	139.5	159.0	170.2	167.3	175.5	200.3	195.6	201.2	206.2	216.5	.....
1921....	166.1	D	169.1	188.0	178.4	183.1	188.0	185.1	190.0	190.3	181.8	155.0	140.0	160.7	170.2	167.2	179.3	200.5	196.1	201.2	208.2	216.4	.....
		Aver.	154.9	186.0	185.8	182.7	185.0	186.1	188.0	190.9	185.4	169.4	140.9	147.8	166.7	165.8	172.2	196.2	196.8	197.4	202.8	211.5	....

Engineering News-Record CONSTRUCTION Cost Index—1913 = 100

Yearly averages prior to 1914			1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
		J	89.22	87.12	112.66	167.75	184.51	198.05	206.55	237.08	168.72	191.70	217.90	210.40	207.15	211.50	203.90	209.40	208.96
1903.....	93.90	F	89.22	87.36	116.66	167.75	184.51	201.50	225.10	230.67	168.72	197.40	220.30	209.70	206.55	210.15	204.65	210.40	206.46
1904.....	87.40	M	88.97	87.66	125.16	175.66	184.51	198.05	240.85	224.27	162.04	205.25	224.70	210.20	207.65	208.80	204.65	207.78	206.80
1905.....	90.55	A	87.97	90.16	129.51	183.41	186.01	191.25	265.20	213.07	164.72	213.50	221.60	209.55	207.05	209.00	206.40	203.40	207.12
1906.....	95.10	M	88.62	90.16	131.06	187.61	186.01	191.25	268.90	210.82	164.62	216.70	222.38	207.20	207.30	206.80	207.00	205.15	205.86
1907.....	100.55	J	87.87	88.96	128.71	199.26	186.31	191.85	273.80	209.82	166.62	220.70	216.85	204.60	204.80	205.55	206.15	205.65	203.36
1908.....	97.20	J	88.12	90.51	127.96	204.01	188.65	193.65	265.65	203.82	169.70	222.10	214.40	204.60	207.80	203.68	206.65	204.77	200.95
1909.....	90.92	A	90.11	91.76	128.76	198.41	193.85	196.65	252.00	193.47	173.40	221.50	213.15	204.60	208.30	205.50	207.29	205.91	200.95
1910.....	96.33	S	90.36	93.01	131.76	190.31	193.85	202.85	255.20	188.27	185.00	221.50	211.25	202.10	208.30	203.60	207.29	207.57	199.58
1911.....	93.43	O	88.51	96.16	135.11	167.11	193.85	202.25	255.20	182.57	188.60	220.30	207.55	205.35	209.80	204.40	207.71	206.32	198.72
1912.....	90.70	N	87.26	101.06	138.16	166.51	193.55	206.85	255.32	166.32	188.60	220.90	205.70	205.95	210.80	201.98	209.46	208.46	198.54
1913.....	100.00	D	86.51	107.06	149.41	167.11	194.75	206.85	251.62	167.82	192.60	217.30	208.58	205.95	210.80	203.90	210.16	209.46	196.86
		Aver.	88.56	92.58	129.58	181.24	189.20	198.42	251.28	201.81	174.45	214.07	215.36	206.68	208.03	206.24	206.78	207.02	202.85

Engineering News-Record CONSTRUCTION Cost Index—1926 = 100

Yearly averages prior to 1914			1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
	1926 = 100	J	42.9	41.9	54.2	80.6	88.7	95.2	99.3	110.0	81.1	92.2	104.7	101.1	99.6	101.7	98.0	100.6	100.4
		F	42.9	42.0	56.1	80.6	88.7	96.9	108.2	110.9	81.1	94.9	105.9	100.8	99.3	101.0	98.4	101.1	99.2
1903.....	45	M	42.8	42.1	60.3	84.4	88.7	95.2	115.8	107.8	77.9	98.7	108.0	101.0	99.8	100.3	98.4	99.9	99.5
1904.....	42	A	42.2	43.3	62.0	88.2	89.5	91.9	127.5	102.4	79.2	102.6	106.5	100.7	99.5	100.4	99.2	97.8	99.6
1905.....	43.5	M	42.6	43.3	63.0	90.2	89.5	91.9	129.3	101.3	79.1	104.2	106.9	99.6	99.7	99.4	99.6	98.6	99.0
1906.....	46	J	42.2	42.7	61.9	95.8	89.5	92.2	131.6	100.9	80.1	106.1	104.3	98.4	98.5	98.8	99.1	98.9	97.8
1907.....	51	J	42.4	43.5	61.5	98.1	90.7	93.1	127.6	98.0	81.6	106.8	103.1	98.4	99.9	97.9	99.3	98.4	96.6
1908.....	47	A	43.3	44.1	62.0	95.4	93.2	94.5	121.1	93.0	83.4	106.5	102.4	98.4	100.1	98.8	99.6	99.0	96.6
1909.....	44	S	43.4	45.1	63.3	91.5	93.2	97.5	122.7	90.5	88.9	106.5	101.5	97.1	100.1	97.9	99.6	99.8	95.9
1910.....	46	O	42.5	46.2	64.8	80.3	93.2	97.2	122.7	87.8	90.7	105.9	99.8	98.7	100.9	98.3	99.8	99.2	95.5
1911.....	45	N	41.9	48.4	66.4	80.0	93.0	99.4	122.7	80.0	90.7	106.2	98.9	99.0	101.3	97.1	100.7	100.2	95.4
1912.....	43.5	D	41.1	51.4	71.8	80.3	93.6	99.4	121.0	80.6	92.6	104.5	100.2	99.0	101.3	98.0	101.0	100.7	94.6
1913.....	48																		
		Aver.	42.5	44.5	62.2	87.1	90.9	95.3	120.8	97.0	83.8	102.9	103.5	99.4	100.0	99.1	99.4	99.5	97.5



to building costs, and when common and skilled labor rates move in similar trends it is a satisfactory measure of relative building cost movement. However, following the low wage rates of 1932, common labor climbed much faster than skilled and reached new all-time highs by July, 1937. The increase was in the lower ranges between union and non-union. When "prevailing" wages became synonymous with union wages the gap closed up, hence the *ENR* 20-cities wage average increased more rapidly than the union rates.

To provide a more representative measure of building cost movement, the skilled labor trend has been substituted for the common labor trend in the *ENR* Construction Cost index, and the *ENR* Building Cost index computed. The labor weighting applied to the *ENR* skilled labor average for 20-cities thus becomes 68.38 hr., and the computation for the Jan. 1942 Building Cost Index is:

Steel	25 cwt. x	2.0675 =	51.69
Lumber	1.088 x	43.75 =	47.60
Cement	6 x	2.19 =	13.14
Labor	68.38 x	1.531 =	104.69
Index			217.12

† Based on 2 x 4 S4S Fir and pine *ENR* 20 cities average lumber component instead of 12 x 12 yellow pine wholesale in New York used prior to 1935. For explanation see page C-5 of June 30, 1938 *ENR*.

CONSTRUCTION Cost Index—1913 = 100

1931	1932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	
194.48	162.48	158.44	191.26	198.22	201.23	221.20	239.62	234.72	238.34	249.69	267.63	J
196.61	161.82	159.30	194.06	195.07	201.33	222.05	238.99	234.31	238.32	250.50	269.41	F
194.51	157.24	158.44	194.06	194.41	201.63	224.75	238.79	234.43	238.29	250.71	269.71	M
191.63	153.12	160.16	195.86	194.65	202.80	231.35	237.95	234.86	238.26	252.40	271.78	A
189.33	152.78	164.39	199.61	193.96	204.05	233.45	236.80	234.69	238.86	255.55	.....	M
187.23	152.20	163.41	199.61	196.73	205.08	237.25	236.86	235.02	241.59	256.79	.....	J
174.37	153.36	165.50	199.65	197.43	204.80	239.90	232.29	234.94	242.15	258.18	.....	J
171.38	156.80	167.00	198.40	197.45	208.48	240.65	232.39	234.90	242.18	260.41	.....	A
171.40	157.96	175.48	200.58	197.30	208.88	241.62	232.70	234.97	244.13	263.12	.....	S
169.78	159.16	187.74	200.86	197.50	211.53	241.90	234.30	236.86	245.02	264.46	.....	O
169.28	158.20	190.14	201.36	197.35	211.50	241.40	234.40	238.20	247.24	266.13	.....	N
166.23	158.46	192.41	201.86	197.20	215.70	241.05	234.89	238.17	249.12	266.16	.....	D
181.35	156.97	170.18	198.10	196.44	206.42	234.71	235.86	235.51	241.96	257.84	.....	Aver.

CONSTRUCTION Cost Index—1926 = 100

1931	1932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	
93.5	78.1	76.2	91.9	95.3	96.7	106.2	114.9	112.9	114.6	120.0	128.7	J
94.5	77.8	76.6	93.3	93.8	96.8	106.7	114.9	112.7	114.6	120.4	129.5	F
93.5	75.6	76.2	93.3	93.5	96.9	108.0	114.8	112.7	114.6	120.5	129.7	M
92.1	73.6	77.0	94.1	93.5	97.5	111.2	114.4	112.9	114.5	121.3	130.6	A
91.0	73.4	79.0	95.9	93.2	98.2	112.0	113.8	112.8	114.8	122.8	.....	M
90.0	73.2	78.5	95.9	94.6	98.5	113.8	113.9	113.0	116.1	123.4	.....	J
83.8	73.7	79.6	96.0	94.9	98.4	115.1	111.7	112.9	116.4	124.1	.....	J
82.4	75.4	80.3	95.4	94.9	100.2	115.7	111.7	112.9	116.4	125.2	.....	A
82.4	75.9	84.4	96.4	94.9	100.4	115.9	111.9	113.0	117.4	126.5	.....	S
81.6	76.5	90.2	96.6	95.0	101.5	116.1	112.7	113.9	117.8	127.1	.....	O
81.4	76.0	91.4	96.8	94.9	101.5	115.8	112.7	114.5	118.9	127.9	.....	N
79.9	76.2	92.4	97.0	94.8	103.4	115.7	112.9	114.5	119.8	127.9	.....	D
87.1	75.4	81.8	95.2	94.4	99.2	112.7	113.3	113.2	116.3	124.0	.....	Aver.

Base Conversion Table

To convert *ENR* Construction and Building Cost Indexes

From 1913 = 100 Base To	Divide 1913 = 100 Values By Const. Cost	 Bldg. Index
1926 = 100	2.0803	1.8499
1929 = 100	2.0702	1.9086
1910–14 = 100	.9380	.9477
1924 = 100	2.1536	1.8578
1923–25 = 100	2.1204	1.8481
1914 = 100	.8856	.9191
1911 = 100	.9343	.9414

Special Building Cost and Volume Indexes

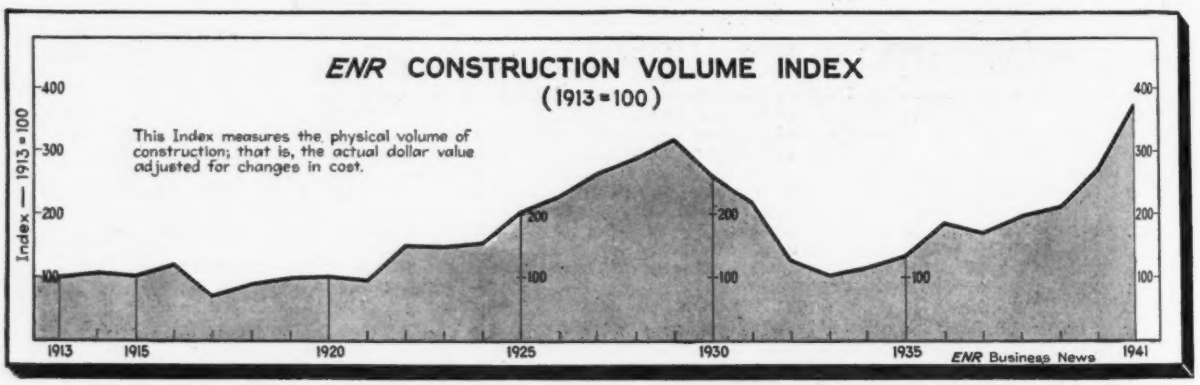
The American Appraisal Company Construction Cost Trend Index — 1913 = 100

For average of four types of buildings: All Frame, Brick Wood Frame, Brick Steel Frame and Reinforced Concrete.

These indices cover structural items only, and do not include factors for Plumbing, Heating, Lighting, Elevators, etc.

	1914	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41
U. S. AVERAGE 1913-'24 — 24 Cities 1925-'41 — 30 Cities	98	101	116	143	177	229	283	216	200	224	222	217	217	217	217	217	200	178	155	150	161	162	170	198	199	200	204	218
Boston	100	103	118	149	183	234	288	220	209	232	229	224	224	222	222	224	212	195	169	163	170	169	178	212	209	210	214	225
New York	99	100	115	142	175	227	299	245	219	245	241	230	234	234	235	237	219	201	170	167	176	174	182	213	216	219	223	233
Buffalo	98	99	115	144	180	232	278	214	197	228	225	218	219	217	213	212	195	178	157	150	160	158	165	202	206	205	207	221
Baltimore	97	99	116	150	193	239	289	215	206	233	229	226	224	226	227	228	211	186	166	158	167	173	180	200	200	198	200	230
Philadelphia	98	102	115	145	181	236	300	220	201	232	230	224	225	228	227	227	209	190	161	156	166	166	171	193	194	196	207	225
Pittsburgh	97	99	115	142	179	231	290	221	201	228	238	233	236	237	236	236	217	198	172	161	170	168	177	211	219	219	219	225
Cincinnati	99	100	115	143	173	217	276	211	194	221	221	219	217	219	219	220	202	176	157	151	161	162	174	206	209	209	213	223
Cleveland	97	99	120	149	179	233	303	227	210	241	243	236	233	231	232	232	213	188	160	151	164	168	175	208	207	206	209	224
Chicago	97	100	116	141	170	224	294	226	202	228	225	224	219	222	222	222	205	185	162	156	166	169	179	204	205	205	207	216
Indianapolis	102	104	119	146	175	221	279	221	202	225	227	222	219	222	224	224	206	182	157	150	161	161	169	199	204	205	209	223
Detroit	99	102	122	150	187	244	304	220	200	229	227	226	224	222	221	220	202	174	148	146	157	160	168	203	205	207	212	226
Milwaukee	100	103	120	150	178	237	290	212	195	224	224	217	218	219	220	218	197	163	144	141	156	163	178	208	208	209	213	225
Minneapolis	98	100	114	142	171	218	277	210	193	214	208	201	197	197	197	198	182	165	148	146	154	154	162	199	201	202	203	214
Kansas City	98	102	120	150	184	239	280	220	211	231	228	220	220	215	213	213	193	178	156	149	160	162	169	202	209	209	211	221
St. Louis	97	100	114	141	175	228	284	225	204	228	238	233	230	226	225	224	205	188	163	156	166	164	171	207	207	207	211	220
Atlanta	97	98	111	140	186	250	304	218	202	226	217	209	211	214	215	215	195	173	147	142	162	163	170	192	185	187	193	215
Dallas	100	105	121	145	176	227	274	209	191	209	206	198	204	204	202	202	187	168	146	139	149	148	154	170	168	171	173	187
New Orleans	97	96	113	136	174	239	282	217	201	225	227	216	217	218	215	215	198	170	145	141	159	159	166	186	187	194	202	214
Denver	100	102	118	145	171	216	262	206	191	202	206	204	204	202	205	207	189	168	149	141	150	151	157	190	193	195	199	209
Seattle	96	101	115	141	176	224	268	197	186	207	206	201	199	195	194	198	184	159	141	136	150	154	161	194	193	195	200	219
San Francisco	97	104	118	139	169	214	258	204	189	208	199	194	188	188	188	190	177	158	144	138	145	144	155	178	176	180	181	201
Los Angeles	97	102	112	133	162	213	251	208	199	213	204	197	195	193	193	196	178	157	141	134	142	140	143	165	166	167	166	183

NOTE — These construction cost index figures are based on 1913 as 100% for each individual location, thus indicating the trend in each city and not the trend between the various locations. The index figures are calculated on the basis of normal average material prices, average labor wages, and the market conditions in the individual cities and do not reflect extremes such as premium prices and overtime wages for rush work during boom periods or the "extreme low" of cut-throat practices during the "depression periods."



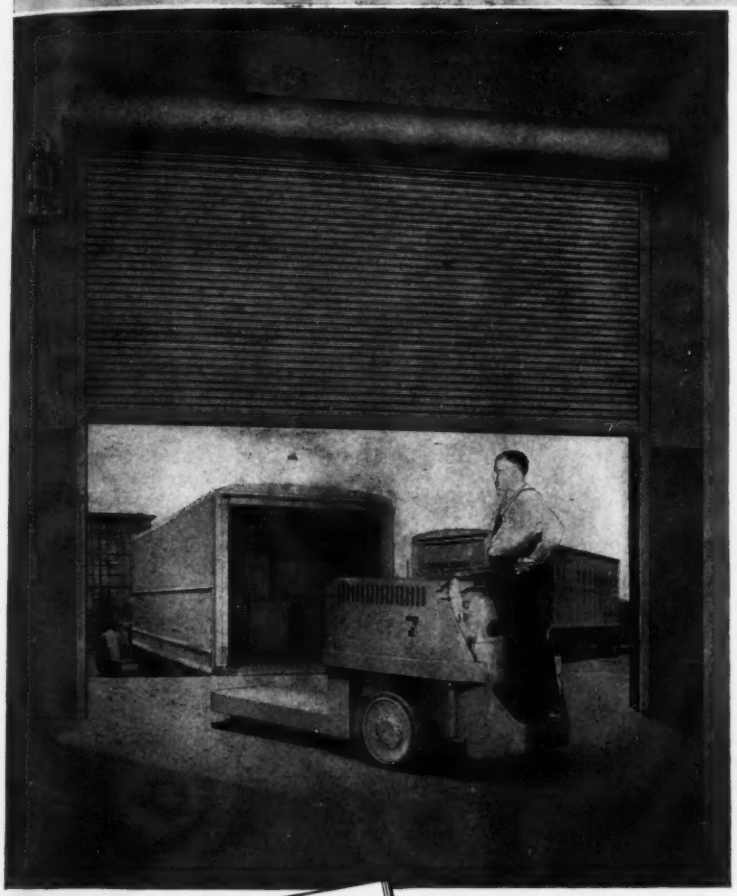
Engineering News-Record Construction Volume Index—1913-100

	1914	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41	'42
Jan.	71	48	96	69	57	38	138	52	100	151	125	141	198	187	208	325	199	208	121	129	149	131	248	168	172	287	173	402	402
Feb.	83	76	95	47	151	91	130	55	68	129	144	145	187	182	225	378	204	198	105	82	156	75	177	181	189	187	196	374	507
Mar.	142	75	90	55	90	52	113	90	186	162	161	161	240	226	318	382	408	278	97	62	130	101	157	146	188	210	162	386	578
Apr.	113	82	137	65	58	78	134	109	161	186	159	211	233	257	316	332	320	289	135	65	109	130	165	160	176	221	191	322	...
May	155	96	129	50	67	80	125	108	221	149	191	209	254	299	299	395	354	251	149	103	101	107	148	214	167	232	201	275	...
June	128	105	129	57	106	129	92	119	178	173	149	214	246	297	308	347	324	243	131	109	119	120	193	246	166	193	225	492	...
July	139	129	136	87	107	122	83	115	146	151	161	178	248	252	266	320	226	248	166	65	128	95	187	187	207	166	308	635	...
Aug.	118	126	130	63	111	135	86	116	137	100	162	266	252	306	306	290	259	187	111	73	94	138	197	152	215	228	281	434	...
Sept.	95	116	145	166	145	113	80	109	149	136	159	262	227	273	296	340	232	225	124	122	101	125	201	150	213	190	324	419	...
Oct.	108	101	97	87	67	307	79	130	154	154	164	233	244	260	363	273	211	229	137	162	98	159	180	167	217	222	490	263	...
Nov.	84	150	105	76	66	71	57	106	114	121	128	194	211	272	251	245	207	180	137	133	115	169	163	148	199	219	331	282	...
Dec.	62	89	106	49	27	41	63	117	134	123	145	206	188	319	244	166	192	133	113	116	105	252	208	143	249	172	344	217	...
Aver.	107	100	119	67	86	98	99	96	147	146	154	201	228	263	287	317	260	220	127	102	114	134	185	172	197	211	269	375	...
1926 = 100	47	44	52	29	38	43	43	42	64	64	68	88	100	115	126	139	114	96	56	45	50	59	81	75	86	92	118	164	...

New value reported in *Engineering News-Record* each month.

ENLIST THESE KINNEAR FEATURES FOR TODAY'S *EXTRA* DOOR NEEDS!

WARTIME BUILDING STANDARDS



1. PROTECTION . . . . .
Kinnear's rugged, all-steel construction prevents theft or intrusion, resists saboteurs or accidental damage, Defies wind, weather—even closes light tight for blackout safety!

2. MOTOR OPERATION!
Motorized doors provide smooth, rapid, dependable operation at all times. Available with every Kinnear Rolling Door!

3. REMOTE CONTROL! . .
Important savings in time and labor can be made by providing pushbutton door control at any number of strategic points.

4. SAVE SPACE! . . . .
All floor, wall and ceiling space around the door remains usable at all times! By providing extra storage or working room, they help keep production rolling at top speed!

5. FIRE SAFETY! . . . .
Kinnear's interlocking steel-slat curtain is highly resistant to fire. (Fire*proof* closure may be had with automatic Kinnear "Akbar" Rolling Fire Doors.)

6. OPEN OUT of the WAY!
The doors coil into a small space above the lintel, are always out of reach of damage, never hinder traffic or other plant operations!

7. LOW MAINTENANCE!
Kinnear's tough, all-steel construction stands up under today's hard, punishing, night-and-day service!

8. QUICK, EASY REPAIR!
Any number of slats can be replaced quickly and easily. Any and all parts are replaceable at any time!

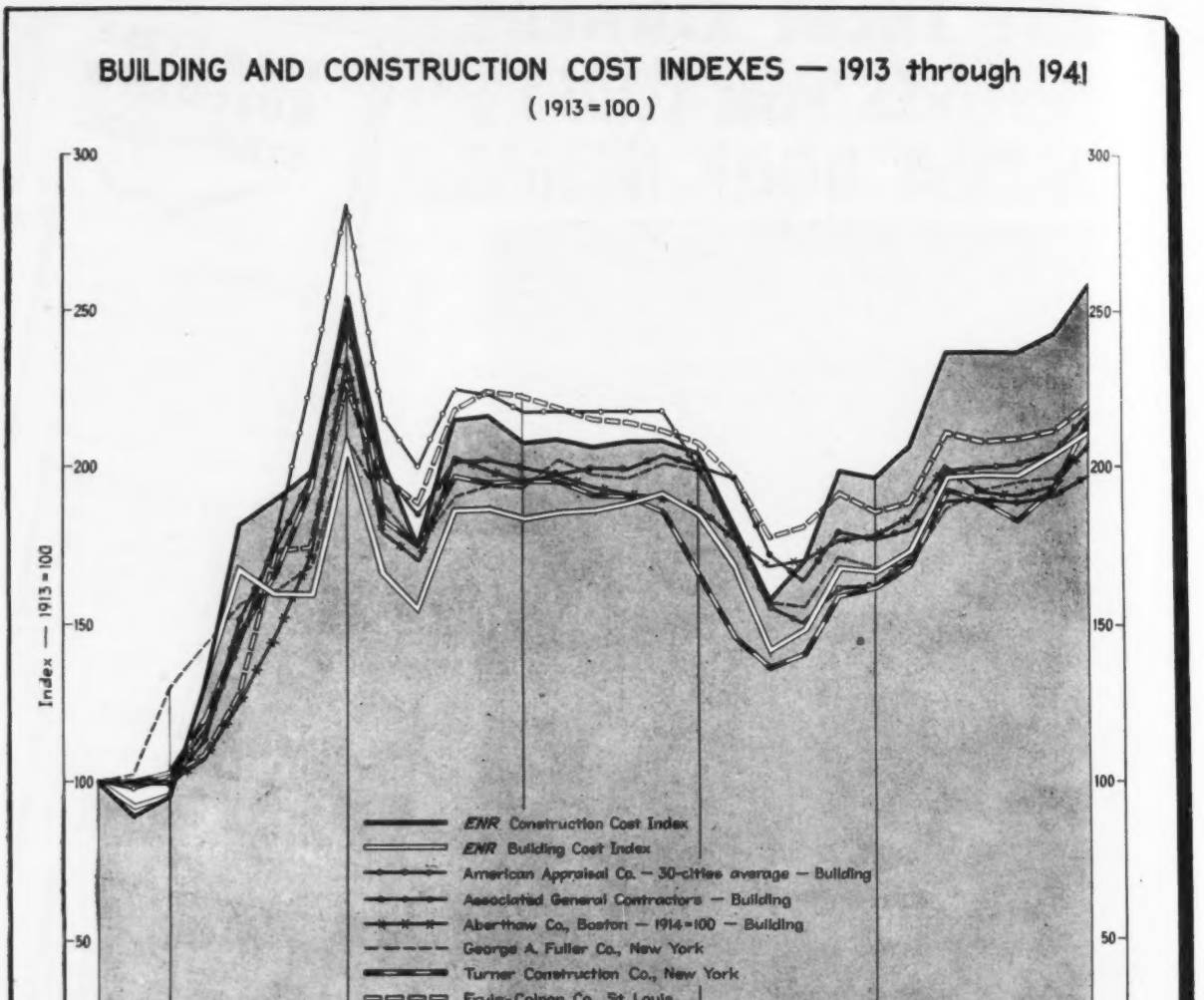
INSTALLATION PROBLEMS ARE AVOIDED!

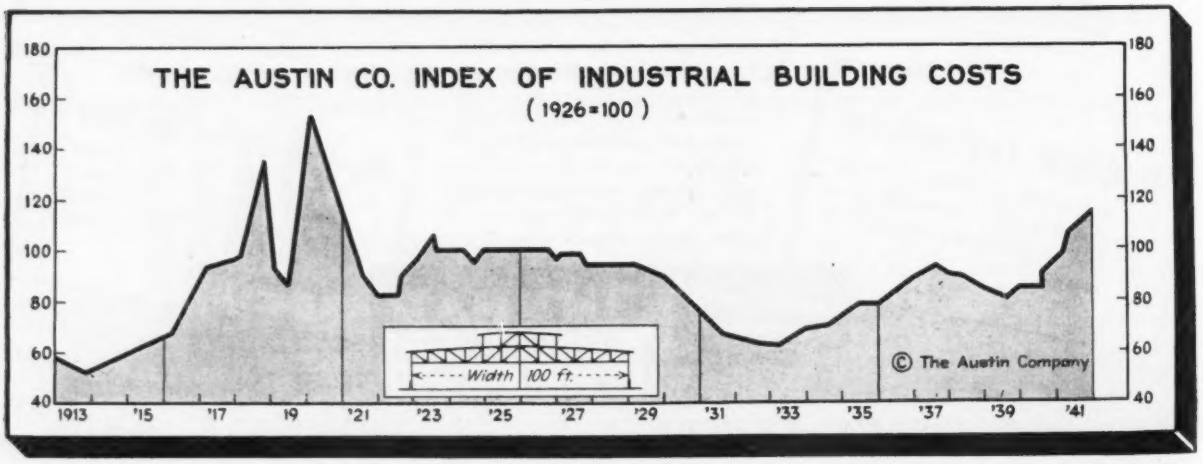
Kinnear Rolling Doors are built any size for any building, and are engineered to fit the individual openings. Economy of installation is assured! Or, if you prefer, Kinnear's nationwide service organization will relieve you of the installation job entirely! Write today for recommendations, or ask for a copy of the new complete catalog on Kinnear Rolling Doors! We'll gladly send you a free copy, without obligation.

SAVING WAYS IN DOORWAYS **KINNEAR** ROLLING DOORS

The **KINNEAR MANUFACTURING** *Company*

1820–40 FIELDS AVENUE **COLUMBUS, OHIO**


BUILDING AND CONSTRUCTION COST INDEXES — 1913 through 1941
(1913 = 100)
Index — 1913 = 100
300
250
200
150
100
50
1913
1915
1920
1925
1930
1935
1941
ENR Construction Cost Index
ENR Building Cost Index
American Appraisal Co. — 30-cities average — Building
Associated General Contractors — Building
Aberthaw Co., Boston — 1914=100 — Building
George A. Fuller Co., New York
Turner Construction Co., New York
Fruin-Colnon Co., St. Louis
ENR Business News


THE AUSTIN CO. INDEX OF INDUSTRIAL BUILDING COSTS
(1926=100)
180
160
140
120
100
80
60
40
1913
'15
'17
19
'21
'23
'25
'27
'29
'31
'33
'35
'37
'39
'41
Width 100 ft.
© The Austin Company

Construction and Building Cost Indexes—1913 through 1941

Year	AAC (Old)	AAC (New)	AGC	ENR Bldg.	ENR Const.	Boeckh New York	Handy R. C. Atl. Seab'd.	ICC-RR Sta. & Off. Bldg.	Aber-thaw	Austin Co.	Fruin-Colnon	Fuller	Tilgh-man Moyer	Turner
Base = 100	1913	1913	1913	1913	1913	1913	1911-'14	1910-'14	1914	1913	1913	1913	1913	1913
1913	100	100	100	100	100	100	...	...	...	100	100	100	100	100
1914	98	98	99	92	89	102	...	...	100	105	100	102	92	100
1915	101	101	100	95	93	99	...	101	100	115	102	130	96	103
1916	116	116	114	131	130	116	153	115	107	141	108	143	115	120
1917	144	143	152	167	181	135	233	135	126	172	128	156	142	147
1918	172	177	175	159	189	155	242	154	147	206	173	160	148	166
1919	213	229	198	159	198	171	237	185	172	198	174	168	190	196
1920	270	283	247	207	251	230	260	215	234	241	227	209	258	252
1921	205	216	200	166	202	193	207	192	179	180	197	188	210	183
1922	189	200	184	155	174	187	165	180	170	157	188	175	177	175
1923	212	224	201	186	214	215	199	194	202	181	217	190	214	196
1924	210	222	202	186	215	215	226	193	198	181	223	194	212	194
1925	203	217	199	183	207	211	219	188	195	185	222	193	209	195
1926	206	217	197	185	208	230	213	184	197	185	218	202	207	195
1927	206	217	200	186	206	223	208	189	193	178	214	197	202	190
1928	205	217	199	188	207	238	205	188	191	172	213	196	204	190
1929	206	217	203	191	207	242	211	187	190	170	211	201	208	185
1930	199	200	200	185	203	238	200	182	186	155	207	199	196	165
1931	171	178	196	169	181	230	184	165	176	131	196	180	170	145
1932	152	155	171	141	157	208	165	141	168	117	178	157	150	136
1933	146	150	163	148	170	197	159	145	170	117	181	155	152	140
1934	157	161	178	167	198	209	186	151	176	128	191	171	163	160
1935	157	162	176	166	196	200	190	151	177	139	185	167	178	162
1936	163	170	179	172	206	205	192	157	184	150	188	168	188	169
1937	181	198	188	196	235	226	208	166	199	165	210	187	214	192
1938	182	199	189	197	236	243	210	166	191	161	207	192	221	188
1939	183	200	188	197	236	248	206	166	190	152	208	195	229	182
1940	...	204	189	203	242	251	210	...	193	163	211	196	231½	193
1941	...	217	198	211	258	255	228	...	207½	198	220	206	...	215

Descriptions of Leading Building and Construction Cost Indexes

AMERICAN APPRAISAL COMPANY (AAC)—Average for 30 cities of four types of buildings: wood frame, brick-wood frame, brick-steel frame, reinforced concrete. Mechanicals not included. Based on actual appraisal costs. Available for individual cities (see page 126). Recently revised to include adjustments for social security taxes, unemployment insurance and corresponding "overhead". Base: 1913=100.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA (AGC)—Wages and materials for 12 cities combined in 40-60 ratio. Wages, prevailing rates for hod carriers and common labor. Materials, weighted: sand, gravel and crushed stone, 1; cement, 1; lumber, 1; hollow tile, ½; structural and reinforcing steel, ½. Base: 1913=100.

ENGINEERING NEWS-RECORD BUILDING COST (ENR Bldg.)—For complete description see pages 124 and 125.

ENGINEERING NEWS-RECORD CONSTRUCTION COST (ENR Const.)—For complete description see pages 124 and 125.

E. H. BOECKH & ASSOC., INC.—Individual series for ten types of buildings for sixteen areas. (See page 138.) Weights based on studies of actual building costs—vary with different type of structures. Labor efficiency correction used. Material prices from local building trade papers. Prevailing skilled and common wage rates from contractors. Base: United States average, 1926-29=100. Series given here is brick and concrete, New York, converted to 1913=100 base.

HANDY PUBLIC UTILITY CONSTRUCTION COST—Compiled and published Jan. 1 and July 1 of each year by Whitman, Requardt & Smith. (See page 132.) Individual series for 81 cost elements in three classes of utility construction, for five geographic divisions of United States.

Weighting based on wide experience in cost analysis of plant and construction. Material prices from Engineering News-Record and Iron Age. Labor cost trends from U. S. Dept. of Labor and National Association of Builders Exchanges. Base 1911-14=100. The reinforced concrete building construction series is tabulated in this table.

RAILROAD CONSTRUCTION INDEX (ICC-RR)—Compiled by Engineering Section, Bureau of Valuation, Interstate Commerce Commission. (See page 130). Indexes for road (47 subseries), equipment (8 subseries), and general expenditures (7 subseries), for national average and 8 regional areas. Series quoted here is road, subseries 16, station and office buildings, national average. Computed from analysis of contracts covering major construction projects over 30-year period, and other information furnished by carriers. Base: 1910-14=100.

ABERTHAW—New England, seven-story and basement (62'4"x202'4"), reinforced concrete building built in 1914, repriced quarterly as a construction bid to duplicate original building. Labor costs based on current experience with similar construction. Base: 1914=100.

AUSTIN INDUSTRIAL BUILDING COST—Repricing typical one-story, steel frame, monitor type industrial building at regular intervals. Structure has concrete foundations, curtain walls of brick and large areas of steel sash and glass; concrete floor laid on ground; 2-in. lumber roof deck on heavy timber covered with 4-ply waterproofing. Monitor sash equipped with mechanical operators. Pricing at representative points in central and eastern states. Base: 1926=100. (See page 128.) Table series converted to 1913=100.

FRUIN-COLNON—Industrial plant of five buildings in St. Louis repriced on basis of contractor's actual and estimated material and labor costs. Base: 1913=100.

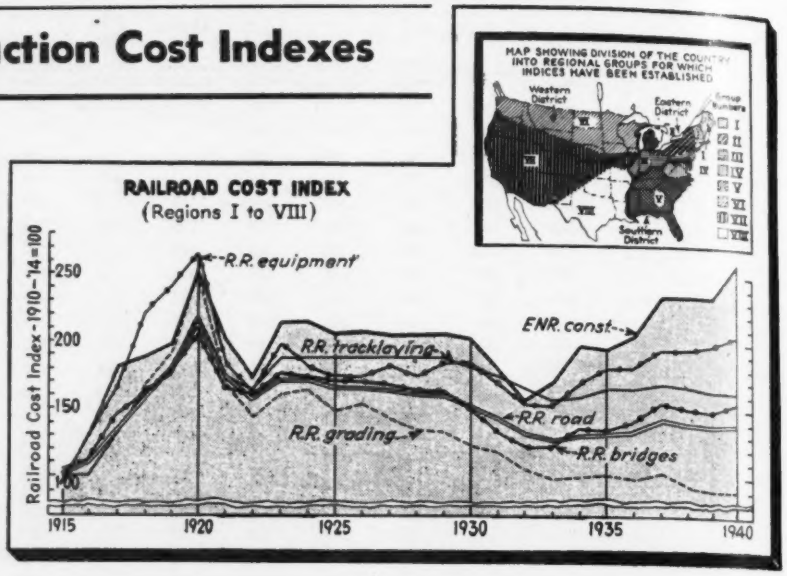
GEORGE A. FULLER COMPANY—Composite of 36 major cost elements, in three commercial type buildings, including mechanicals, elevators, wiring, heating and ventilating, repriced. Base 1913=100.

TILGHMAN MOYER COMPANY—Compiled monthly from actual cost records in construction of bank buildings in eastern United States. Includes all typical building items, and, in addition, all fixtures which are special in bank work, which in many cases exceed structural costs. Index reflects saving occasioned by use of reconditioned equipment from closed banks. Base: 1913=100. Not computed in 1941.

TURNER CONSTRUCTION COMPANY—Eastern cities. Own building cost experience applied to these factors: labor rates, material prices, productivity of labor, efficiency of plant and management, competitive conditions. Base: 1913=100.

Railroad Construction Cost Indexes

THESE INDEXES by Engineering Section, Bureau of Valuation, Interstate Commerce Commission, include items developed from analysis of major construction contracts over a period of 30 years. Indexes for material accounts are based on studies of carriers' returns to Valuation Order 14, joint studies made with various sub-committees of Presidents' Conference Committee, well-known engineering and trade publications, contracts covering major construction projects over a period of 30 years, and other information furnished by individual carriers.



Railroad Cost Indexes for Regions by Years for "Road" Construction — 1910-14 = 100

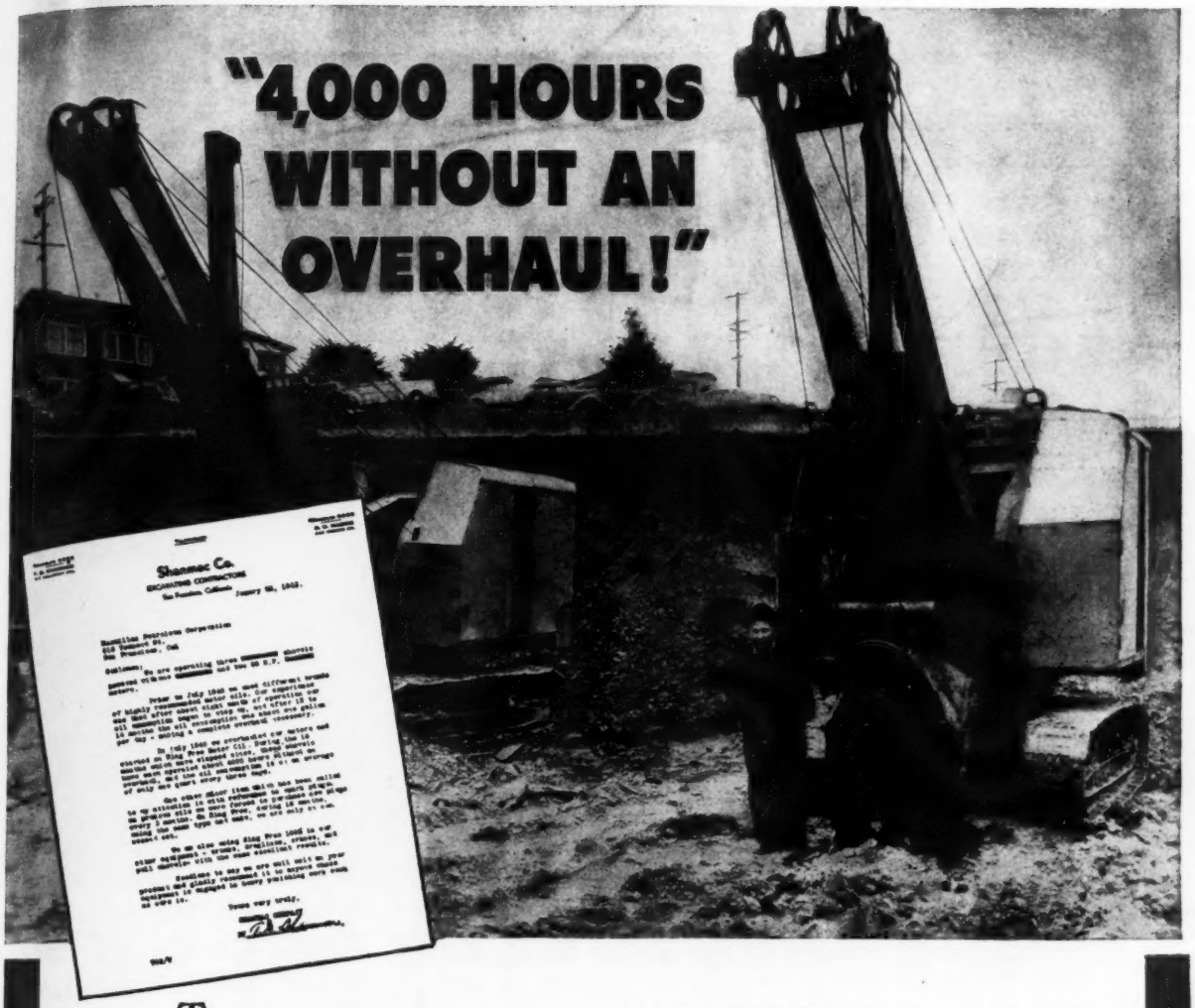
Total of Accounts 1-46, ROAD, Engineering Section, Bureau of Valuation, Interstate Commerce Commission, August 1, 1941

United States	Per Cent	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
Reg. I to VIII	73.09	159	178	214	175	157	171	171	166	166	164	161	160	152	143	131	127	131	131	133	142	138	137	140
Reg. I	75.36	162	184	220	178	163	177	178	172	173	171	167	166	158	148	134	131	133	134	136	146	141	140	144
Reg. II	68.15	160	180	214	176	160	174	174	168	168	167	165	164	157	145	133	130	134	134	136	146	142	141	145
Reg. III	67.99	160	180	214	176	160	173	173	169	168	167	164	163	155	143	132	129	133	133	136	146	142	144	146
Reg. IV	70.49	157	180	214	173	152	167	166	164	163	159	155	154	145	133	126	122	125	126	127	137	132	131	135
Reg. V	76.66	158	179	218	171	153	168	167	163	164	160	156	156	148	137	129	125	129	128	131	141	137	136	139
Reg. VI	77.41	157	177	215	175	155	169	170	163	164	162	158	158	150	138	129	125	128	128	129	139	134	132	135
Reg. VII	75.62	157	175	212	177	158	170	170	165	166	163	160	158	151	139	131	128	130	129	131	140	135	133	135
Reg. VIII	78.15	160	176	208	173	157	171	171	166	167	164	161	161	154	143	133	130	133	134	135	144	141	140	142

(Indexes represent territorial index factors and are not necessarily applicable for determining unit reproduction costs upon individual roads.)

Railroad Cost Indexes by Accounts Applicable to Entire U. S., Regions I to VIII, Incl.

"Road" Construction	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
Engineering	159	178	214	175	157	171	171	166	166	164	161	160	152	143	131	127	131	131	133	142	138	137	140
Grading	165	190	250	170	143	160	164	140	153	143	135	133	123	118	106	98	100	101	99	103	93	90	90
Underground Power Tubes																							
Tunnels and Subways	150	183	208	179	165	179	179	179	178	169	155	155	143	130	119	111	122	120	130	139	141	140	149
Bridges, Culverts, etc.	162	178	206	165	160	176	173	171	170	168	164	163	150	134	122	122	136	135	141	155	150	149	156
Elevated Structures	177	184	210	150	153	173	171	168	165	163	163	162	154	144	129	122	136	136	137	158	150	149	159
Ties	133	170	201	189	157	177	175	172	173	175	176	175	170	155	144	139	149	147	150	159	154	158	164
Rails	148	152	168	158	144	145	145	144	144	144	144	144	144	144	140	134	123	123	124	143	139	136	138
Other Track Material	210	203	209	192	161	182	179	177	177	177	177	170	169	165	163	158	150	147	150	169	169	167	167
Ballast	140	150	207	191	176	175	175	174	175	176	176	176	168	159	146	146	141	139	140	143	143	143	143
Track Laying and Surfacing	163	175	218	174	165	188	188	188	188	188	188	188	182	175	164	157	159	165	165	169	167	165	165
Right-of-way Fences	178	194	204	189	177	179	179	176	175	175	175	173	171	164	147	135	140	140	138	143	144	139	159
Snow, Sand Fences, Sheds	165	199	280	197	194	212	200	201	201	204	204	204	198	188	125	126	140	140	140	155	155	155	155
Crossings and Signs	161	182	208	171	164	178	175	171	169	166	165	165	161	153	131	127	139	137	139	152	145	142	146
Station and Office Bldgs.	154	185	215	192	180	194	193	188	184	189	188	187	182	165	141	145	151	151	157	166	166	166	177
Roadway Buildings	156	185	216	192	178	196	196	189	187	192	191	190	186	166	140	145	150	150	150	162	162	162	177
Water Stations	170	191	213	185	178	187	187	186	182	185	186	184	177	161	147	151	155	155	156	166	166	166	172
Fuel Stations	160	190	212	181	166	185	185	182	180	183	183	183	174	159	144	149	154	154	153	159	159	159	163
Shops and Engine Houses	159	188	216	191	180	193	192	188	185	189	188	187	176	161	137	142	147	147	155	165	165	165	176
Grain Elevators	150	185	214	190	184	197	197	193	190	195	193	193	182	165	137	142	147	147	156	164	164	164	166
Storage Warehouses	155	185	210	193	178	198	198	193	189	193	191	191	184	165	137	142	147	147	154	166	166	166	176
Wharves and Docks	152	178	204	167	158	175	175	174	177	173	178	178	172	158	136	141	146	146	149	153	153	153	161
Coal and Ore Wharves	155	184	204	170	159	176	176	174	174	176	176	176	172	157	136	142	147	147	151	153	153	153	160
Gas Producing Plants	175	194	213	194	176	188	189	186	185	188	189	189	178	163	145	148	176	176	178	178	177	179	188
Telegraph and Telephone Lines	158	164	192	191	162	187	179	163	157	163	165	165	150	138	121	119	124	128	131	135	129	129	134
Signals and Interlockers	152	165	175	163	158	165	164	162	169	158	155	154	147	138	130	130	133	136	138	143	143	143	146
Power Dams, Canals, Pipe Lines																			151	149	149	149	150
Power Plant Buildings	158	189	218	197	184	196	196	191	186	191	191	189	177	162	138	143	148	148	152	167	167	167	176
Power Substation Buildings	156	187	218	194	180	197	197	192	188	193	191	190	176	161	137	142	147	147	138	164	164	164	175
Power Transmission System	181	186	176	145	132	142	136	140	141	137	142	150	136	116	98	98	103	105	108	123	110	110	114
Power Distribution System	192	189	205	172	163	178	172	175	176	175	178	181	173	148	144	144	148	151	152	155	149	149	155
Power Line Poles, Fixtures	169	194	230	208	179	209	203	185	183	198	199	209	200	172	147	147	150	153	148	157	152	152	152
Underground Conduits	172	206	250	228	214	220	215	220	216	219	219	217	215	175	175	175	180	184	185	185	185	185	185
Miscellaneous Structures	156	186	217	192	170	195	195	190	186	191	190	189	182	164	141	146	151	151	154	161	161	161	168
Paving	177	205	217	191	190	191	191	191	190	190	190	190	190	181	156	150	145	145	145	150	150	150	150
Roadway Machines	146	158	170	162	149	151	151	151	151	151	149	148	147	144	138	138	147	147	147	161	153	154	158
Roadway Small Tools	179	184	202	181	170	173	185	190	190	191	191	190	160	155	155	150	150	150	160	170	180	180	180
Shop Machinery	192	200	210	198	173	183	185	185	186	187	189	191	176	166	155	155	179	179	179	198	200	202	212
Power Plant Machinery	192	200	210	198	173	183	185	185	186	187	189	191	176	166	155	155	179	179	193	206	199	205	215
Power Substation Apparatus	192	200	210	198	173	183	185	185	186	187	189	191	176	166	155	155	155	150	145	149	151	150	158



THE EXPERIENCE of the Shanmac Company, excavating contractors of San Francisco was that prior to July 1940 they used different brands of recommended motor oils.

But after about eight months of operation, their oil consumption began to step up. And after 12 to 14 months the oil consumption was about a gallon a day—making a complete overhaul necessary.

"In July 1940 we overhauled our motors and started on RING-FREE Motor Oil," writes T. G. Shannon.

"During the 18 months which have elapsed since, our shovels have each operated about 4,000 hours without an overhaul, and the oil consumption is on an average of only one quart every three days."

On other oils they had to purchase new spark plugs every three months. On RING-FREE, they are on only their second set after 18 months.

"We are using RING-FREE 100% in our other equipment—trucks, draglines, cranes, and pull shovels with the same excellent results. Needless to say we are well sold on your product and gladly recommend it to anyone whose equipment is engaged in heavy, punishing work."

RING-FREE is the only oil you need, as Mr. Shannon points out, for all the different kinds of equipment used by contractors.

What RING-FREE has done for others, it can do for you. Write us!

* * *

MACMILLAN PETROLEUM CORPORATION
50 West 50th Street, New York · 624 So. Michigan Avenue, Chicago · 530 West 6th Street, Los Angeles

MACMILLAN
RING-FREE
MOTOR OIL

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Macmillan Petroleum Corporation

Public Utility Construction Cost Index

Compiled and published by Whitman, Requardt and Smith, Consulting Engineers, Baltimore, Md., for the Estate of William W. Handy

Table No. 1 Cost Trends of Building Construction, 1911 to 1914 = 100

(Complete Index reports 13 items entering into Building Construction Costs)

Cl. of Constr. Mat'l. and Labor	1918	Jan. 1 1919	Jan. 1 1920	July 1 1920	Nov. 1 1920	Jan. 1 1921	Sept. 1 1921	Feb. 1 1922	Jan. 1 1923	Jan. 1 1924	July 1 1924	Jan. 1 1925	July 1 1925	Jan. 1 1926	July 1 1926	Jan. 1 1927	July 1 1927	Jan. 1 1928	July 1 1928	Jan. 1 1929	July 1 1929	Jan. 1 1930	July 1 1930	Jan. 1 1931	July 1 1931	Jan. 1 1932	July 1 1932	Jan. 1 1933	July 1 1933	Jan. 1 1934	July 1 1934	Jan. 1 1935	July 1 1935	Jan. 1 1936	July 1 1936	Jan. 1 1937	July 1 1937	Jan. 1 1938	July 1 1938	Jan. 1 1939	July 1 1939	Jan. 1 1940	July 1 1940	Jan. 1 1941	July 1 1941	Jan. 1 1942
Atlantic Seaboard Division																																														
Reinf. Conc.	242	237	238	274	269	233	182	165	199	227	224	221	216	213	213	214	203	204	206	209	212	205	194	189	179	171	159	153	165	178	194	191	189	191	192	199	216	214	205	205	207	210	209	220	235	250
Brick	212	220	246	279	278	245	207	188	215	237	232	230	229	228	229	230	223	224	217	219	220	212	207	203	194	189	173	166	175	189	200	195	194	197	197	203	218	217	211	211	214	217	216	224	235	246
North Central Division																																														
Reinf. Conc.	230	220	220	270	263	228	181	163	193	219	214	212	208	203	201	205	194	195	197	200	203	199	190	185	177	169	154	151	162	175	186	182	182	186	187	196	209	209	200	200	200	202	201	210	225	237
Brick	198	199	224	272	269	238	201	181	206	225	218	216	215	212	211	214	208	209	201	203	205	199	195	192	186	181	164	161	170	183	190	185	184	188	189	197	207	208	203	203	203	205	204	210	220	229
South Central Division																																														
Reinf. Conc.	236	224	224	268	263	229	181	160	191	213	206	203	196	192	191	194	186	186	188	191	193	187	179	176	159	149	144	140	148	160	173	179	173	175	177	187	200	198	188	188	187	189	190	199	216	232
Brick	204	203	228	271	270	240	224	181	206	221	211	208	205	203	204	205	201	202	195	197	198	190	185	183	168	160	154	151	157	171	179	182	175	178	180	186	198	197	191	191	191	193	194	200	212	223
Plateau Division																																														
Reinf. Conc.	234	221	220	260	256	221	181	164	192	215	208	208	201	198	197	199	188	189	191	194	196	190	180	177	166	153	149	146	156	168	178	174	172	176	180	188	206	203	194	194	194	197	196	205	218	230
Brick	203	202	226	264	264	232	203	185	207	223	214	214	211	211	210	211	205	205	199	200	201	193	187	184	175	167	163	160	168	182	187	182	181	182	185	191	206	204	199	199	200	201	201	206	214	221
Pacific Division																																														
Reinf. Conc.	233	220	225	266	259	226	187	165	191	212	205	203	196	191	190	196	185	185	188	191	194	188	178	175	165	157	148	145	153	166	177	174	173	175	178	186	200	199	192	192	192	194	192	201	217	238
Brick	201	199	229	268	265	234	207	185	204	217	206	205	201	198	197	203	197	197	190	192	194	186	180	177	169	164	156	154	156	170	177	172	173	176	179	185	198	197	193	193	193	195	194	199	210	226

Table No. 2 Cost Trends of Gas Plant Construction, 1911 = 100

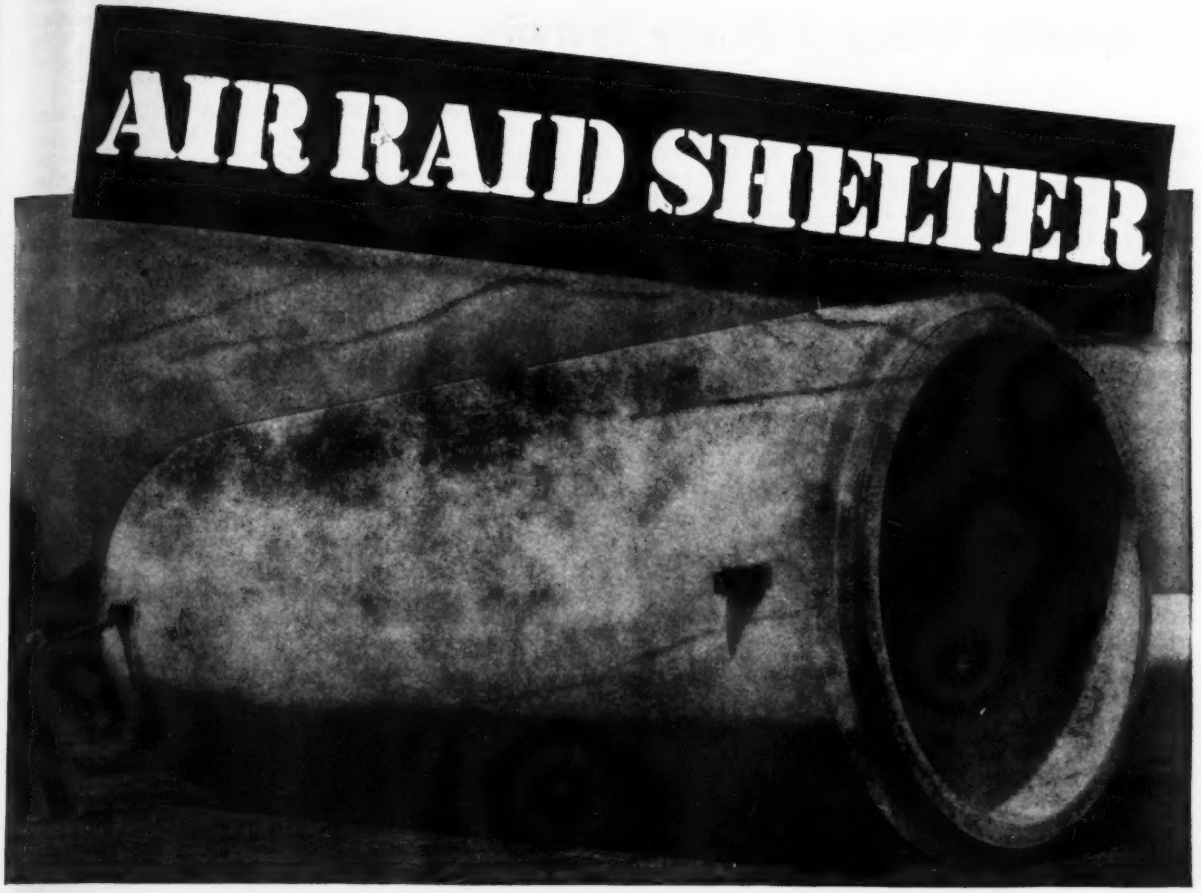
(Complete Index reports 17 items entering into Gas Plant Construction Costs) A, relates to Total Constr. & Equip.; B relates to Mech Equip. Exclusive of Gas Holders

	1915	1916	1917	1918	Jan. 1 1919	Jan. 1 1920	July 1 1920	Jan. 1 1921	Sept. 1 1921	Jan. 1 1923	Jan. 1 1924	July 1 1924	Jan. 1 1925	July 1 1925	Jan. 1 1926	July 1 1926	Jan. 1 1927	July 1 1927	Jan. 1 1928	July 1 1928	Jan. 1 1929	July 1 1929	Jan. 1 1930	July 1 1930	Jan. 1 1931	July 1 1931	Jan. 1 1932	July 1 1932	Jan. 1 1933	July 1 1933	Jan. 1 1934	July 1 1934	Jan. 1 1935	July 1 1935	Jan. 1 1936	July 1 1936	Jan. 1 1937	July 1 1937	Jan. 1 1938	July 1 1938	Jan. 1 1939	July 1 1939	Jan. 1 1940	July 1 1940	Jan. 1 1941	July 1 1941	Jan. 1 1942
Atlantic Seaboard Division																																														
A	112	136	186	229	239	253	279	265	205	224	241	238	234	229	230	230	226	223	215	216	216	219	218	216	214	208	202	188	176	178	189	216	216	217	218	218	225	246	246	244	241	249	253	253	257	264	272
B	108	138	195	233	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297
North Central Division																																															
A	109	131	180	203	210	221	257	248	201	206	226	224	220	217	217	218	214	211	204	205	204	206	207	208	207	203	198	178	182	185	196	203	202	203	208	208	219	235	237	235	232	232	236	236	238	245	249
B	108	138	195	233	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297
South Central Division																																														
A	114	145	182	213	214	223	251	246	203	196	214	210	205	199	199	200	198	195	187	187	187	190	188	187	185	177	171	160	158	167	177	184	195	196	202	202	208	223	222	219	216	217	220	220	223	236	244
B	108	138	195	233	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297
Plateau Division																																														
A	107	128	180	207	207	214	234	231	194	193	210	206	206	201	202	202	198	195	187	189	189	191	189	188	186	181	176	166	170	173	184	191	190	190	195	195	202	221	221	220	216	217	220	220	223	228	232
B	108	138	195	233	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297
Pacific Division																																														
A	107	128	180	207	209	228	255	248	212	203	219	215	211	206	205	206	206	203	196	197	197	201	200	198	197	191	187	177	180	178	189	196	195	197	198	203	210	228	228	230	227	228	232	231	235	244	253
B	108	138	195	233	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297

Table No. 3 Cost Trends of Electric Light and Power Construction, 1911 = 100

(Complete Index reports 50 items entering into Electric Light and Power Construction Costs) A, relates to Total Constr. & Equip.; B, to Electr. Plant — Steam; C, to Sub-Sta. Equip.

Cl. of Constr. Mat'l. and Labor	1916	1917	1918	Jan. 1 1919	Jan. 1 1920	July 1 1920	Jan. 1 1921	Sept. 1 1921	Jan. 1 1923	Jan. 1 1924	July 1 1924	Jan. 1 1925	July 1 1925	Jan. 1 1926	July 1 1926	Jan. 1 1927	July 1 1927	Jan. 1 1928	July 1 1928	Jan. 1 1929	July 1 1929	Jan. 1 1930	July 1 1930	Jan. 1 1931	July 1 1931	Jan. 1 1932	July 1 1932	Jan. 1 1933	July 1 1933	Jan. 1 1934	July 1 1934	Jan. 1 1935	July 1 1935	Jan. 1 1936	July 1 1936	Jan. 1 1937	July 1 1937	Jan. 1 1938	July 1 1938	Jan. 1 1939	July 1 1939	Jan. 1 1940	July 1 1940	Jan. 1 1941	July 1 1941	Jan. 1 1942
Atlantic Seaboard Division																																														
A	132	160	192	202	208	226	221	183	189	201	196	201	197	197	194	193	187	192	192	195	206	204	188	191	188	182	176	170	177	186	200	200	199	204	205	213	230	226	222	224	225	232	231	233	242	248
B	119	132	160	187	196	206	216	194	186	195	192	199	196	197	196	194	190	193	192	200	298	206	198	198	195	192	186	182	186	200	205	205	204	205	209	210	229	226	223	225	224	235	234	234	236	241
C	111	130	161	178	175	197	201	182	176	187	186	191	190	184	178	176	172	173	173	170	181	179	174	177	175	172	168	165	166	172	184	184	184	185	187	188	204	204	203	203	203	212	212	212	213	217
North Central Division																																														
A	129	154	178	184	189	214	210	176	179	193	189	194	192	190	187	187	182	186	186	189	199	199	184	188	187	186	174	172	179	187	195	195	194	199	199	209	224	222	216	219	218	222	221	222	232	235
B	112	123	145	163	172	188	197	179	171	185	185	189	189	189	188	188	185	188	187	195	202	203	195	197	199	199	186	186	189	203	204	203	202	204	205	209	227	225	222	224	223	225	224	224	229	229
C	104	122	145	155	151	180	184	167	162	178	179	182	184	178	171	171	168	169	169	167	177	176	172	177	179	181	169	169	171	176	184	184	184	184	184	187	204	203	202	203	202	203	203	203	206	207
South Central Division																																														
A	130	157	183	188	193	218	216	183	182	193	186	189	186	184	183	182	179	183	186	189	199	197	185	186	183	179	171	169	179	187	195	198	193	199	201	208	224	221	216	218	218	223	224	227	239	245
B	114	127	152	169	178	197	210	188	181	190	186	189	186	187	189	187	186	189	195	202	210	209	205	204	203	200	190	189	198	211	212	212	203	208	212	214	234	232	229	231	230	235	237	240	246	250
C	107	125	152	160	157	189	195	176	172	182	181	181	181	175	171	170	169	170	176	174	184	182	182	184	183	181	173	173	179	185	192	192	184	188	191	192	211	210	209	210	209	213	216	219	223	226
Plateau Division																																														
A	128	155	183	187	189	211	209	178	179	192	186	191	191	190	188	186	181	185	185	188	198	197	181	183	181	177	171	169	179	188	196	196	195	198	198	206	225	221	216	218	219	223	222	223	232	234
B	114	125	153	171	175	193	202	186	178	191	189	191	194	197	196	194	190	193	193	200	208	207	199	198	197	194	188	188	197	211	212	211	210	210	210	212	234	232	229	231	232	235	234	234	236	237
C	106	124	154	162	154	184	187	173	168	184	183	184	188	185	177	176	172	173	173	171	182	179	175	177	*177	175	171	171	177	183	191	191	191	189	189	189	210	209	208	209	211	212	212	212	212	213
Pacific Division																																														
A	127	156	178	182	194	214	214	185	178	187	182	185	182	180	178	181	175	180	179	182	192	191	176	178	175	172	163	161	170	178	189	189	192	196	197	204	221	218	214	216	215	219	218	219	231	235
B	111	127	145	161	179	192	206	191	172	180	178	180	178	178	177	182	178	181	180	187	195	193	186	186	185	182	170	170	178	191	198	197	203	204	204	206	226	223	221	222	222	223	223	223	231	231
C	104	125	146	153	160	184	193	180	163	174	173	174	173	167	161	165	162	163	163	161	171	168	165	167	166	164	155	155	161	166	179	179	184	185	185	186	204	203	202	203	202	203	203	203	209	210



. . for your water supply

Natural enemy target would be the water supply line of a sighted community. Against the threat of air attack or sabotage—your safest shelter lies in steel-reinforced concrete.

Lock Joint Pipe can take it! Its underlying strength rests in the solid toughness of its dense concrete walls—in its cylindrical steel skeleton ribbed with bars of steel—in the flexibility of its self-caulking joints. Each unit of a Lock Joint Pressure line is a thick-walled bulwark of defense against terrific vibration and shock. Nor are those sub-surface enemies, corrosion and tuberculation, able to successfully attack the hydraulic efficiency of a Lock Joint supply line. Never—in the 37 years of our history, in all the lengths of our pipe lying throughout the world—has there been a failure. Construction and design make Lock Joint Pipe your safest, surest investment today—yet Lock Joint Pipe uses less of those essential materials so necessary to our War effort. Whether your project is large or small, play safe with Lock Joint Reinforced Concrete Pressure Pipe. Your 'phone call, telegram, cable or letter to any of our offices will bring an immediate response.

LOCK JOINT PIPE COMPANY

Established 1905

AMPERE, NEW JERSEY

Denver, Colo. • Chicago, Ill. • Kenilworth, N. J. • Kansas City, Mo.
Rock Island, Ill. • White Plains, N. Y. • Valley Park, Mo.
Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

SCOPE OF SERVICES

Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply Mains as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

Relative Value of Utility Systems

C. F. Lambert, Utility Engineer and Consultant, Miami, Fla.

THIS RECORD brings up to Jan. 1, 1942, values of five utilities originally published in *Engineering News-Record*, May 7, 1925 and brought up to date annually in *Construction Costs*, 1931 to 1937.

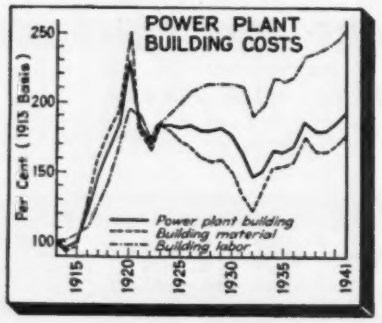
In computing each of these five utility value trends, additional plants have been added until about twice as many are now used as originally. The trend in equipment as well as in prices is thus followed. Values for each year are the average for the entire year.

Definition of the items used in computing these price trends is shown for each utility in the accompanying summary.

Table II shows values on a 1926 base, Table III on a 1913 base. Charts on the opposite page illustrate comparable annual values of all five utilities as well as the annual average trend, the preceding 5- and the preceding 10-year average trends, while Table I gives the 1941 monthly values which also are charted in an adjacent column to demonstrate the consistent rise that took place all through the year. Power plant building values with their accompanying labor and material trends are charted separately on this page.

Summary of Data Covered

POWER PLANT BUILDINGS: 50 buildings—Relative values shown by chart only, labor and material trends shown separately. *Building* items include cement in both plain and reinforced concrete, sand,



crushed rock, brick, reinforcing steel, structural steel, roofing, sheet metal, windows, doors, heating material, electric lighting, common labor, carpenters, bricklayers, structural iron workers, metal workers, roofers and electricians.

WATERWORKS: 25 systems—68 items including *Land*, entirely a local matter (study indicates that the most accurate relation of land to other values is obtained by keeping land unit the same throughout the period); *Buildings; Equipment*, boilers, stokers, boiler settings, pumps, motors, steam pumps, condensers, steam piping, miscellaneous equipment, erection; *Distribution*, cast iron pipe, steel pipe, wood pipe, valves, hydrants, meters, standpipes, reservoirs, filter plants, labor; *Miscellaneous*, furniture, fixtures, tools, automobiles, miscellaneous.

ELECTRIC LIGHT PLANTS: 25 plants—84 items including *Land; Buildings; Equipment*, boilers, stokers, steam piping, auxiliary equipment, engines, turbines, diesels, condensers, generators, switchboards; *Distribution*, substation equipment, transformers, lighting equipment, poles, conductors, hardware, wire, insulators, meters, distribution transformers, underground cables, erection; *Miscellaneous*, furniture, fixtures, tools, automobiles, miscellaneous.

STREET RAILWAY SYSTEMS: 10 systems—82 items including *Land; Buildings*, car barns and shops; *Track Construction*, tangent track, special layouts, grading, paving, concrete and steel bridges, rails, spikes, bolts, ties, labor; *Span Construction*, poles, conductors, pole hardware, copper, erection; *Cars & Equipment; Miscellaneous*, furniture, fixtures, tools, automobiles, miscellaneous. Power plant buildings excluded because power is so frequently purchased from separate department or company.

NATURAL GAS PLANTS: 15 systems—58 items including *Land; Buildings; Equipment*, holders, small pumps, miscellaneous; *Distribution*, cast iron pipe, steel pipe, regulators, governors, valves, meters; *Miscellaneous*, furniture, fixtures, tools, autos.

MANUFACTURED GAS SYSTEMS: 25 plants—63 items including *Land; Buildings; Equipment*, boilers, gas machinery holders, miscellaneous; *Distribution*, cast iron pipe, steel pipe, regulators, valves, meters; *Miscellaneous*, furniture, fixtures, tools, autos.

Table I—Relative Monthly Value

For 1941 with 1913 = 100

	Water-works	Electric Light	Street Ry.	Natural Gas	Artificial Gas
Jan.	196.0	184.9	167.7	185.8	197.4
Feb.	196.2	185.0	168.0	186.1	197.6
Mar.	196.4	184.6	168.9	186.3	197.8
Apr.	197.0	185.1	169.7	187.2	198.4
May	198.3	185.9	170.7	188.6	199.0
June	198.9	187.0	171.4	189.5	199.9
July	199.8	188.5	173.3	190.2	200.4
Aug.	200.1	188.8	174.0	190.3	200.6
Sept.	201.2	189.4	175.0	191.2	200.9
Oct.	201.5	190.0	175.3	191.3	201.2
Nov.	202.0	190.1	176.1	192.1	201.6
Dec.	202.1	190.5	177.5	192.1	201.6
Average	199.1	188.0	172.4	189.2	199.3

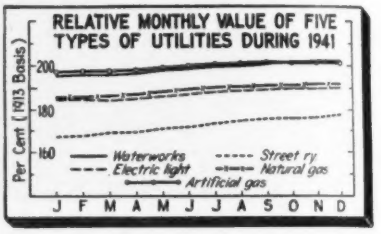


Table II—Relative Yearly Utility Values—Lambert Based on 1926 Costs

	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941
Waterworks Plants																	
A	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
B	10.9	11.0	10.7	10.6	10.8	10.5	9.6	8.8	9.0	9.9	9.9	10.1	11.3	10.9	10.9	11.0	11.4
C	12.1	12.0	11.9	12.2	12.3	11.8	11.1	10.3	11.1	12.1	12.0	12.1	13.6	13.1	13.0	13.2	13.4
D	75.8	74.4	67.5	65.6	69.8	68.9	65.2	59.7	62.3	68.7	69.4	69.9	76.9	75.6	74.4	76.8	78.4
E	1.1	1.1	1.0	1.0	1.0	1.0	.8	.7	.9	.9	.9	.9	1.0	1.0	1.0	1.0	1.1
T	101.4	100.0	92.6	90.9	95.4	93.7	88.2	81.0	84.8	93.1	93.7	94.5	104.3	102.1	100.8	103.5	105.8
Electric Light Plants																	
A	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
B	10.8	10.8	10.6	10.6	10.8	10.3	9.6	8.7	8.8	9.8	9.8	10.0	11.1	10.7	10.7	10.9	11.3
C	42.9	42.5	41.9	42.5	43.9	41.4	38.8	35.5	38.5	43.4	43.1	43.3	48.0	46.9	46.2	46.5	46.9
D	41.3	41.6	41.4	42.5	44.2	42.0	39.2	34.5	36.0	41.1	40.6	41.3	46.5	43.8	44.5	45.1	46.8
E	3.6	3.5	3.3	3.3	3.3	3.2	2.9	2.6	2.7	2.9	2.9	2.9	3.2	3.1	3.0	3.0	3.3
T	100.2	100.0	98.8	100.5	103.8	98.5	92.1	82.9	87.6	98.8	98.0	99.1	110.4	106.1	106.0	107.1	109.9
Street Railway Systems																	
A	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
B	5.0	5.0	4.9	4.9	4.9	4.8	4.4	3.9	4.1	4.5	4.5	4.6	5.1	5.0	5.0	5.1	5.3
F	63.6	63.6	62.7	62.6	61.7	60.4	57.9	53.5	54.2	56.5	55.5	56.0	60.9	59.0	58.4	59.3	61.2
G	23.5	23.5	23.5	23.0	23.0	23.1	19.6	18.6	17.8	20.7	21.0	21.6	24.0	23.4	22.8	23.1	25.1
H	4.7	4.6	4.7	4.8	5.0	4.8	4.5	4.0	4.0	4.3	4.3	4.5	4.7	4.5	4.4	4.5	4.8
E	1.8	1.8	1.8	1.7	1.7	1.7	1.5	1.4	1.4	1.6	1.6	1.6	1.8	1.7	1.7	1.7	1.7
T	100.1	100.0	99.1	98.5	97.8	96.3	89.4	82.9	83.0	89.1	88.4	89.8	98.0	95.1	93.8	95.2	99.6
Natural Gas Plants																	
A	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9
B	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.3	1.3	1.4	1.4	1.4	1.6	1.6	1.6	1.6	1.7
C	1.6	1.6	1.6	1.6	1.5	1.5	1.4	1.3	1.4	1.5	1.6	1.7	1.8	1.8	1.8	1.8	1.8
D	93.3	93.0	90.6	90.8	91.2	89.9	87.5	82.7	83.2	90.0	89.4	86.1	92.8	91.3	89.6	92.0	93.1
E	2.9	2.9	2.8	2.8	2.8	2.8	2.6	2.3	2.3	2.4	2.4	2.4	2.6	2.6	2.5	2.5	2.7
T	100.3	100.0	97.4	97.6	97.9	96.6	93.8	88.5	89.1	96.2	95.7	92.5	99.7	98.2	96.4	98.8	100.2
Artificial Gas Systems																	
A	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
B	6.6	6.7	6.5	6.4	6.6	6.4	5.9	5.4	5.5	6.1	6.1	6.2	6.9	6.6	6.6	6.7	6.9
C	32.2	32.3	32.1	31.6	31.2	28.7	26.2	25.2	27.4	30.6	31.3	31.8	37.1	37.3	37.0	37.1	37.6
D	57.1	56.8	54.0	53.8	55.3	54.6	53.2	49.3	49.5	54.3	54.3	53.4	57.3	56.4	55.4	57.2	57.8
E	2.1	2.0	2.0	2.0	2.0	1.9	1.8	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.9
T	100.2	100.0	96.8	96.0	97.3	93.8	89.3	83.7	86.1	94.9	95.6	95.3	105.3	104.3	103.0	105.0	106.4

A—Land. B—Buildings. C—Equipment. D—Distribution. E—Miscellaneous. F—Track Construction. G—Cars and Equipment. H—Span Construction. T—Total.

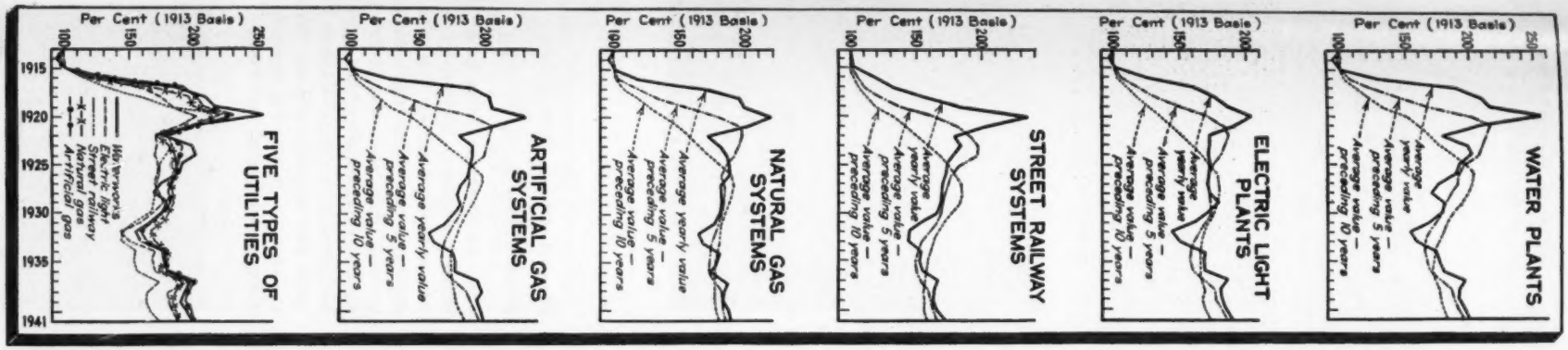


Table III—Relative Yearly Value of Main Items Entering Into Physical Value of Five Utilities 1913-1941—1913=100—Lambert

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941
Waterworks Plants																													
Land.....	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Bldgs....	11.2	10.8	11.1	13.3	16.5	18.5	20.6	25.6	20.9	19.0	20.8	20.7	20.6	20.7	20.2	20.1	20.4	19.7	18.2	16.6	16.9	18.7	18.6	18.9	20.9	20.5	20.6	20.9	21.5
Equip....	12.1	12.0	14.0	17.3	22.6	23.4	24.3	26.0	23.4	21.8	22.9	23.0	22.9	22.7	22.5	23.0	23.2	22.3	20.9	19.5	21.0	22.9	22.5	22.7	25.0	24.7	24.3	24.9	25.2
Distr.....	72.7	67.1	71.3	94.1	143.2	161.1	165.8	197.8	155.8	130.1	149.8	152.2	143.2	140.5	127.5	123.8	131.8	130.0	123.3	112.6	116.8	129.7	130.7	131.8	144.8	142.7	140.2	144.7	147.6
Misc.....	1.1	1.1	1.2	1.4	1.8	2.0	2.3	2.8	2.2	2.0	2.2	2.0	2.1	2.0	1.9	1.9	1.9	1.9	1.6	1.4	1.6	1.7	1.7	1.7	1.9	1.8	1.8	1.8	1.9
Total...	100.0	93.9	100.5	129.0	187.0	207.9	215.9	255.1	205.2	175.8	198.6	200.8	191.7	188.8	175.0	171.7	180.2	176.8	166.9	153.0	159.2	175.9	176.4	178.0	195.5	192.6	189.8	195.2	199.1
Electric Light Plants																													
Land.....	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Bldgs....	10.1	9.7	10.0	12.0	14.9	16.7	18.5	23.1	19.9	17.1	18.8	18.6	18.5	18.6	18.2	18.2	18.5	17.8	16.5	14.9	15.2	16.8	16.7	17.0	18.8	18.4	18.5	18.8	19.4
Equip....	38.9	36.7	36.7	47.9	73.5	79.5	81.0	86.7	84.6	75.1	73.4	73.5	73.6	73.0	72.0	72.9	75.4	71.0	66.6	60.9	66.2	75.5	73.9	74.3	82.2	80.2	79.0	79.8	80.3
Distr.....	44.8	43.5	47.1	56.1	63.4	69.6	75.2	82.6	77.4	70.4	70.4	69.6	70.9	71.2	71.1	72.9	75.8	71.7	67.1	59.4	61.8	70.3	69.2	70.3	79.3	74.6	75.7	77.0	80.0
Misc.....	3.4	3.4	3.4	4.1	5.1	6.0	6.8	8.6	6.8	6.2	6.2	6.1	6.1	6.0	5.7	5.6	5.6	5.5	5.0	4.5	4.6	4.9	4.9	4.9	5.3	5.2	5.1	5.1	5.5
Total...	100.0	96.1	100.0	122.9	159.7	174.6	184.3	203.8	191.5	171.6	171.6	170.6	171.9	171.6	169.8	172.4	178.1	168.8	158.0	142.5	150.6	169.3	167.5	169.3	188.4	181.2	181.1	183.5	188.0
Street Railway Systems																													
Land.....	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Bldgs.....	4.7	4.5	4.6	5.6	6.9	7.8	8.6	10.8	8.8	8.0	8.8	8.7	8.6	8.6	8.5	8.5	8.6	8.3	7.6	6.9	7.1	7.8	7.8	7.9	8.8	8.5	8.5	8.7	9.0
Trk. Cstr.	64.3	63.1	63.4	71.9	83.3	104.8	113.8	144.1	119.9	105.4	113.6	112.8	110.2	110.2	108.6	108.5	106.9	104.7	100.1	92.9	94.1	97.9	96.0	96.9	104.6	102.2	101.2	103.1	106.0
Span Cstr.	5.8	5.4	6.3	8.7	9.9	9.7	10.0	11.1	9.0	8.5	8.7	8.8	8.1	8.0	8.1	8.4	8.7	8.4	7.8	7.0	7.0	7.5	7.4	7.7	8.2	7.8	7.7	8.0	8.4
Cars, eq...	20.9	22.4	22.8	25.1	27.2	31.1	44.4	61.1	59.1	53.0	47.0	42.9	40.7	40.7	40.7	39.9	39.9	39.9	34.0	32.4	30.8	35.8	36.4	37.3	41.6	40.5	39.4	40.1	43.4
Misc.....	1.7	1.6	1.6	2.2	2.9	3.2	3.5	4.3	3.6	3.2	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.0	2.7	2.5	2.5	2.7	2.7	2.7	3.0	3.0	2.9	3.0	3.0
Total...	100.0	99.6	101.3	116.1	132.8	159.2	182.9	234.0	203.0	180.7	184.0	179.0	173.4	173.3	171.6	170.9	169.7	166.9	154.8	144.3	144.1	154.3	152.9	155.1	168.8	164.6	162.3	165.5	172.4
Natural Gas Plants																													
Land.....	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Bldgs.....	1.6	1.5	1.6	1.9	2.4	2.6	2.9	3.7	3.0	2.7	2.9	2.9	3.0	3.0	2.9	2.9	2.9	2.8	2.6	2.4	2.4	2.7	2.7	2.7	3.0	3.0	3.0	3.0	3.1
Equip....	1.7	1.6	1.8	2.6	4.0	3.6	3.5	4.1	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	2.9	2.8	2.6	2.4	2.7	2.9	2.9	3.0	3.3	3.3	3.3	3.3	3.4
Distr.....	92.4	89.9	92.0	111.0	155.7	182.9	186.5	202.4	187.3	158.4	168.7	173.2	175.0	174.6	169.9	170.3	171.1	168.8	164.7	155.0	157.8	169.0	168.2	163.0	175.5	172.6	169.4	174.2	176.1
Misc.....	2.9	2.8	2.9	3.3	4.4	5.1	5.8	7.8	6.4	5.6	5.9	5.7	5.5	5.4	5.3	5.2	5.2	5.2	4.8	4.3	4.2	4.5	4.4	4.4	4.9	4.8	4.7	4.8	5.0
Total...	100.0	97.4	99.9	120.4	168.1	195.8	200.3	219.6	201.4	171.4	182.2	186.5	188.1	187.6	182.7	183.0	183.7	181.2	176.3	165.7	168.7	180.7	179.8	174.7	188.3	185.3	182.0	186.9	189.2
Artificial Gas Systems																													
Land.....	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Bldgs.....	6.8	6.5	6.7	8.1	10.0	11.2	12.5	15.5	12.7	11.5	12.6	12.5	12.4	12.5	12.2	12.1	12.4	12.0	11.1	10.1	10.3	11.3	11.3	11.5	12.7	12.4	12.4	12.7	13.0
Equip....	30.4	29.1	33.1	49.9	76.4	68.7	67.2	75.9	66.1	62.8	63.4	61.2	60.5	60.6	60.3	59.4	58.7	53.9	49.2	47.2	51.4	57.4	58.3	59.2	68.7	69.1	68.6	68.9	69.6
Distr.....	56.5	54.4	55.6	68.1	98.3	114.8	116.5	130.4	115.6	98.2	107.5	108.6	107.3	106.7	101.5	101.0	103.8	102.6	99.7	92.5	93.8	102.1	102.0	100.3	108.0	106.2	104.4	108.0	108.9
Misc.....	2.1	2.1	2.1	2.5	3.1	3.6	4.1	5.5	4.6	4.1	4.2	4.0	3.9	3.8	3.8	3.7	3.7	3.7	3.5	3.0	3.1	3.2	3.2	3.2	3.5	3.5	3.4	3.4	3.6
Total...	100.0	96.3	101.7	132.8	192.0	202.5	204.5	231.5	203.2	180.8	191.9	190.5	188.3	187.8	182.0	180.4	182.8	176.4	167.7	157.0	162.8	178.2	179.0	178.4	197.1	195.4	193.0	197.2	199.3

These Bethlehem Building Products ar

Speed's the Watchword in Fabricated Steel Construction

Bethlehem's steel fabrication and erection division is an integral part of a complete steel-making organization, and has the facilities and experience to fabricate and erect steel with maximum efficiency and speed. Current work includes ordnance plants, emergency factories, tank arsenals, bomber plants—every type of steel structure needed in the nation's war effort.

Structural Shapes for Every Emergency Construction Need

Although the list of Bethlehem structural shapes has been simplified as a war-time measure, the range of Bethlehem structurals is ample and can be drawn upon for all the structural steel requirements of the emergency construction program. Both the well-known Bethlehem Wide-Flange Sections, and American standard sections are rolled by Bethlehem.

Steel H-bearing Piles for Foundation Work

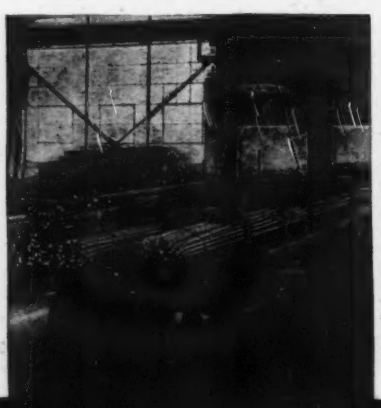
Bethlehem H-bearing piles are being used in the foundations of new or expanding munition plants, ordnance works, and other war-time construction. Bethlehem Steel Sheet and Z-Piling is on the job in many of the harbor and river improvement projects now completed or under way. All Bethlehem Piling has excellent driving qualities and a high resistance to batter damage.

These Bar Mats Stay Flat, Save Placement Time

Bethlehem Bar Mats are made of reinforcing bars securely fastened together. They are specially designed to stay relatively flat even under the roughest kind of handling. This keeps the necessity for straightening reinforcing material before placement at the minimum, cuts down idle equipment time, does much to insure continuous, smooth progress of any highway-building job.

Here's Complete Service on Reinforcing Steel

Bethlehem reinforcing steel warehouses are geared to give prompt, efficient service. In these warehouses are maintained fully-equipped shops, staffed by experienced men who cut, bend and fabricate reinforcing steel to meet the contractor's specifications; reinforcing material is delivered ready for immediate installation. Bethlehem Bars are of constant section, made from new-billet steel.



Pre-assembled Road Joints Mean Faster Road Building

Here's an important factor for speed in highway building. Bethlehem Road Joints reach the job-site ready for installation. Everything is pre-assembled into one unit. All that is needed is to slip on the pre-cut fibre filler, place the joint, and anchor it. Bethlehem Road Joints stay in place; will not tip over when concrete is poured or when the finishing machine passes over them.

BETHLEHEM STEEL

Other Bethlehem Building Products

STEEL PIPE STEEL SHEETS

BOLTS AND NUTS—RIVETS DARDELET RIVET-BOLTS

HIGHWAY CABLE GUARD STEEL HIGHWAY POSTS

Economy, Fast Erection, Fire-safety with Open-web Steel Joists

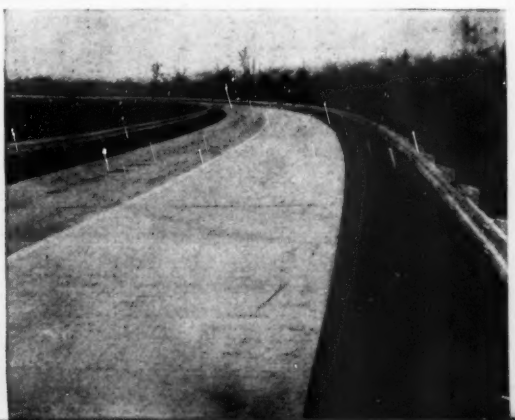
Bethlehem Open-Web Steel Joists are an excellent choice for all kinds of light-occupancy structures. Easy to install, they make it possible to provide fire-safety at moderate cost; the open-web design facilitates installation of duct-work and pipe. In buildings where clear spans up to 64 feet, free of columns, are desired, use Bethlehem Open-Web Long-span Joists.

Purple Strand Form-Set Wire Rope for Toughest Jobs

For outstanding service in the toughest jobs, Bethlehem Purple Strand Form-Set Wire Rope is recommended. Preformed and made from Improved Plow Steel, the strongest steel used in commercial wire-rope manufacture, Purple Strand Form-Set is as easy to handle as it is tough and rugged. It's relaxed, won't wicker when wires are broken, has excellent resistance to bending fatigue.

Better Highway Protection With Safety-Beam Guard Rail

Bethlehem Safety-Beam Guard Rail is rolled in a sturdy, streamlined channel shape. No anchor rods, anchor posts, or post brackets are necessary. A single bolt in each post in the run is all that is required. Bethlehem Steel Guard Posts are the ideal complement to Safety Beams. These sturdy steel posts are quickly driven into place by a sledge or power hammer.



Boeckh Index of Construction Costs — U. S. Average, 1926–'29 = 100

Annual Averages By Cities	Residences		Apartments, Hotels, Office Bldgs.			Commercial & Factory Bldgs.				
			—Brick and—					—Brick and—		
	Frame	Brick	Wood	Conc.	Steel	Frame	Steel	Wood	Steel	Conc.
ATLANTA AREA										
1926–29	82.7	87.0	84.2	83.7	87.0	82.9	94.5	84.7	87.5	86.8
1913	41.2	43.7	42.4	43.3	45.6	40.6	45.2	43.0	44.3	43.0
1917	54.4	57.2	56.6	63.7	69.4	46.0	90.6	56.6	74.4	63.9
1918	71.3	74.8	72.7	74.6	80.1	69.7	93.2	72.4	80.7	75.4
1919	103.6	105.1	100.6	87.0	95.0	109.5	95.3	96.1	90.9	86.5
1920	137.1	139.6	133.1	110.6	119.6	140.6	111.8	129.6	108.5	111.0
1921	85.1	88.1	83.9	81.9	84.0	84.5	75.6	82.2	76.8	84.0
1922	83.4	85.8	81.8	79.6	82.2	83.6	73.1	79.5	74.6	80.6
1923	88.6	92.8	89.1	88.9	91.5	88.3	86.7	88.0	86.1	91.9
1924	85.0	89.8	89.2	91.1	91.9	88.8	88.8	88.3	89.8	94.7
1925	81.7	86.5	85.6	88.6	88.6	85.3	89.4	85.1	83.4	92.5
1926	83.1	87.1	83.7	85.1	86.4	82.1	93.4	84.5	86.6	85.1
1927	82.4	85.9	83.6	83.2	84.6	81.8	96.5	84.2	85.5	85.6
1928	85.6	89.4	86.7	86.0	87.9	84.8	93.3	85.7	88.5	86.6
1929	79.7	85.6	82.8	80.5	88.2	82.9	94.8	84.4	89.4	89.9
1930	80.9	85.3	82.8	84.5	85.7	78.2	91.8	83.6	83.6	86.1
1931	78.6	82.8	80.2	80.4	80.4	77.2	82.2	81.6	80.4	82.1
1932	71.0	75.2	73.6	77.2	77.0	68.7	80.8	77.4	78.1	78.3
1933	64.6	69.6	68.3	77.9	76.1	62.7	79.5	71.8	79.0	82.0
1934	70.6	76.6	74.6	83.8	83.4	68.9	91.5	78.5	86.4	87.4
1935	68.4	72.4	73.2	83.9	82.6	64.9	89.7	77.7	85.6	87.6
1936	68.4	72.4	73.2	84.4	83.3	65.8	89.7	77.8	85.8	87.1
1937	79.0	85.1	82.8	92.7	92.2	76.7	97.9	85.7	93.7	95.2
1938	81.6	85.0	85.2	95.9	96.2	79.5	100.5	87.4	96.9	98.1
1939	82.8	86.0	86.1	95.1	95.0	80.6	96.2	88.6	94.6	97.4
1940	88.1	90.3	90.6	96.8	97.3	86.3	100.1	91.5	97.3	98.4
1941	96.2	97.5	97.9	99.6	100.7	95.2	103.0	96.9	100.7	101.2
BALTIMORE AREA										
1926–29	107.2	112.0	107.6	100.6	100.7	106.3	95.5	106.8	98.8	101.2
1937	88.8	93.2	90.4	93.4	93.8	87.9	97.0	91.8	95.4	93.0
1938	91.9	94.8	94.1	98.0	98.0	91.7	100.4	95.6	99.5	98.5
1939	93.5	95.5	95.6	99.3	99.2	94.0	101.7	96.6	101.4	100.2
1940	100.1	101.3	102.0	102.5	103.0	101.0	105.3	102.7	106.1	103.3
1941	109.2	109.9	110.4	107.4	108.1	111.2	108.3	109.7	110.8	108.2
BOSTON AREA										
1926–29	116.3	120.3	115.4	106.2	107.0	118.8	106.3	112.5	108.7	105.8
1937	103.3	110.5	106.6	111.6	109.2	103.5	112.1	107.6	114.4	113.2
1938	104.1	109.4	107.8	114.5	111.9	103.8	113.9	109.1	117.0	116.4
1939	106.2	110.4	110.1	116.3	113.7	105.7	114.2	111.5	118.2	118.5
1940	111.7	114.7	114.3	116.9	114.9	112.3	114.6	114.6	119.1	119.2
1941	121.3	122.4	122.2	118.1	117.6	123.4	115.9	119.3	121.1	120.2
CHICAGO AREA										
1926–29	109.2	114.2	109.8	113.2	109.1	112.9	105.2	105.9	112.0	116.0
1937	104.8	110.7	105.9	116.9	111.8	108.3	109.1	104.0	115.3	120.8
1938	107.9	110.6	109.5	122.7	117.8	111.5	117.9	108.0	122.4	126.7
1939	110.6	112.5	111.1	123.6	118.7	114.2	117.6	109.3	122.6	127.6
1940	117.3	117.8	116.5	124.9	120.9	121.8	118.5	113.4	124.2	128.4
1941	126.9	125.5	124.3	126.9	124.1	132.9	119.9	118.9	126.6	129.6
CINCINNATI AREA										
1926–29	100.5	105.0	101.3	101.0	100.2	100.2	99.6	103.1	100.6	101.0
1937	98.8	106.1	102.9	107.5	105.3	98.2	107.9	104.7	109.1	109.7
1938	100.4	105.1	104.0	112.4	109.2	100.0	111.7	106.0	113.4	114.8
1939	103.3	106.2	105.9	113.9	110.4	103.3	111.7	107.1	113.7	116.5
1940	105.9	108.6	107.8	116.0	112.4	105.9	112.3	108.9	114.5	119.2
1941	112.8	114.0	113.7	116.5	114.5	114.6	112.8	112.6	116.0	118.1
CLEVELAND AREA										
1926–29	107.2	113.4	108.5	111.3	108.3	109.0	103.0	107.2	110.5	114.8
1937	105.1	112.3	107.7	112.5	109.1	106.5	110.6	108.1	114.8	116.3
1938	105.8	109.8	109.4	115.5	112.8	107.0	113.0	109.9	118.1	118.3
1939	106.2	109.6	109.5	115.3	112.8	107.5	112.9	109.5	117.7	118.0
1940	107.8	111.1	110.9	116.1	113.5	109.2	112.3	110.5	117.9	119.2
1941	118.3	120.5	120.1	122.6	120.2	121.7	116.9	118.2	124.1	125.9
DALLAS AREA										
1926–29	103.1	107.3	103.2	98.9	99.1	103.6	100.5	100.9	99.4	99.7
1937	89.9	95.2	92.2	92.0	94.2	88.5	95.0	94.4	94.1	92.3
1938	91.2	92.6	92.7	95.5	96.6	89.7	102.5	93.6	98.1	94.8
1939	95.1	95.8	96.7	98.8	100.2	94.8	106.6	96.0	101.9	98.9
1940	100.7	100.7	101.8	101.1	103.3	100.9	112.8	100.5	106.6	100.6
1941	110.6	109.2	110.2	103.3	106.7	112.2	112.2	106.0	108.9	102.5
DETROIT AREA										
1926–29	103.3	108.4	104.3	102.9	102.4	103.7	103.1	103.5	103.3	104.4
1937	93.9	100.7	97.3	103.4	101.7	94.3	107.0	97.6	107.4	106.5
1938	97.1	101.8	101.8	108.7	107.3	96.9	110.3	102.9	112.5	110.5
1939	98.8	102.7	102.9	108.6	107.5	98.7	108.8	104.2	111.4	110.1
1940	103.3	106.0	106.3	109.2	108.7	103.6	109.7	106.4	111.6	110.6
1941	113.4	114.6	114.7	114.7	114.1	114.8	112.3	113.1	116.6	116.3
MINNEAPOLIS AREA										
1926–29	92.8	98.2	94.6	95.6	96.1	92.8	100.0	93.9	97.9	98.4
1937	101.6	107.6	104.2	108.6	106.8	103.0	111.7	101.8	111.6	112.1
1938	101.2	105.5	103.9	113.4	111.2	102.1	114.7	103.3	115.2	117.2
1939	101.9	105.0	104.2	113.5	110.7	102.7	113.4	103.6	114.5	117.2
1940	106.1	108.2	107.5	113.6	111.7	107.8	113.8	105.4	115.3	117.2
1941	116.6	116.9	116.2	116.4	115.9	120.0	115.8	112.3	118.7	119.9
NEW ORLEANS AREA										
1926–29	93.3	96.3	93.4	86.5	90.6	93.3	93.7	91.5	89.5	86.5
1937	83.4	87.0	84.7	86.6	89.9	82.6	98.1	84.4	91.6	85.6
1938	86.3	87.5	88.5	92.2	95.6	85.0	102.0	88.3	96.0	91.5
1939	89.0	90.3	91.3	95.4	98.3	88.1	102.8	91.7	98.5	94.9
1940	97.3	97.4	98.1	100.3	102.2	97.3	104.7	97.9	101.6	99.2
1941	106.3	105.7	105.9	106.7	108.6	107.9	112.1	104.4	108.7	106.7
PHILADELPHIA AREA										
1926–29	100.3	106.3	103.7	105.9	103.1	98.1	101.9	104.2	104.1	107.5
1937	91.4	98.0	95.3	98.7	97.8	89.1	100.9	97.7	99.7	100.3
1938	93.8	98.5	98.6	104.6	102.2	92.4	103.7	101.7	104.7	106.7
1939	99.2	102.3	102.9	105.7	104.1	98.2	102.0	105.0	105.5	106.7
1940	103.0	105.4	106.0	106.7	106.1	102.1	104.9	107.4	107.9	107.5
1941	113.3	114.0	114.4	111.7	111.6	113.9	109.1	113.6	113.0	111.8

Annual Averages By Cities	Residences		Apartments, Hotels, Office Bldgs.			Commercial & Factory Bldgs.				
			—Brick and—					—Brick and—		
	Frame	Brick	Wood	Conc.	Steel	Frame	Steel	Wood	Steel	Conc.
NEW YORK CITY AREA										
1926–29	133.3	138.4	131.9	122.8	120.4	137.5	113.1	127.4	123.2	125.3
1913	59.5	60.6	57.5	53.9	54.8	61.4	51.4	53.2	53.2	53.7
1917	77.6	78.9	76.4	73.2	78.7	79.9	97.0	72.5	83.9	72.3
1918	87.7	89.9	86.4	82.2	87.2	89.2	98.2	83.6	89.2	83.1
1919	100.5	103.5	99.3	92.0	96.9	101.2	97.1	97.2	93.6	91.6
1920	136.9	142.0	135.8	123.3	130.0	137.1	120.9	135.0	122.6	123.6
1921	109.8	114.5	109.2	101.3	100.8	110.0	96.1	109.1	100.1	103.5
1922	109.5	114.3	109.0	99.0	98.7	109.8	88.4	109.3	96.3	100.1
1923	124.6	131.3	125.6	112.3	112.2	125.5	105.7	127.0	112.7	115.8
1924	123.5	129.1	123.6	114.4	113.9	125.0	108.5	122.4	115.6	115.7
1925	122.8	126.9	120.4	111.4	110.1	125.7	104.2	117.5	110.3	113.3
1926	131.4	136.9	130.1	120.3	116.7	133.7	118.3	128.1	118.2	123.0
1927	128.4	133.3	126.4	117.2	113.1	131.4	106.5	123.6	115.6	119.9
1928	136.5	140.2	133.5	125.8	122.6	140.5	112.4	126.6	128.2	128.0
1929	140.6	143.2	137.6	127.9	129.2	144.4	115.2	131.3	130.8	130.3
1930	126.7	132.6	125.3	124.1	118.7	131.9	113.8	120.3	123.6	128.0
1931	117.8	124.0	117.8	119.7	113.9	122.7	116.7	113.4	122.8	123.8
1932	100.4	108.1	102.6	105.5	99.8	104.8	102.2	99.8	109.1	112.0
1933	85.0	92.4	88.4	101.1	93.3	85.2	90.1	91.0	97.6	106.2
1934	98.3	104.5	100.2	108.2	103.5	99.8	104.6	100.2	108.8	112.2
1935	92.2	92.5	93.2	103.6	99.6	94.1	102.9	92.9	105.3	107.4
1936	96.4	101.8	97.4	106.8	102.2	98.8	104.9	96.2	107.2	110.5
1937	110.5	115.8	111.2	119.6	116.5	113.1	117.8	109.1	120.6	121.2
1938	118.9	121.4	119.6	128.4	124.0	121.9	123.2	117.0	128.3	130.4
1939	122.1	123.3	122.5	130.6	125.9	125.6	123.7	119.6	130.0	133.3
1940	124.6	125.7	125.1	132.0	127.4	128.0	124.3	122.2	131.2	134.9
1941	134.6	134.1	133.3	135.0	131.3	139.4	126.6	128.7	134.4	137.1
PITTSBURGH AREA										
1926–29	113.3	118.8	112.8	111.2	107.1	115.4	89.6	112.2	104.6	112.9
1937	109.8	117.5	112.9	112.1	109.0	109.1	102.1	115.3	110.6	114.1
1938	112.7	116.4	114.7	117.1	113.7	113.2	114.2	115.6	116.6	118.9
1939	113.8	117.0	115.7	117.5	114.2	114.2	109.8	116.5	116.9	119.1
1940	115.0	117.3	116.7	117.7	114.4	115.6	109.5	117.4	116.2	119.3
1941	125.3	125.7	125.3	120.6	118.7	127.4	111.4	123.8	119.6	122.3
ST. LOUIS AREA										
1926–29	118.6	121.1	115.7	109.9	108.8	121.3	103.3	111.7	107.7	109.3
1913	62.6	63.7	60.0	56.7	57.3	63.9	53.4	57.8	54.7	57.6
1917	69.7	71.4	69.5	71.7	79.5	71.1	95.3	66.5	81.3	71.5
1918	88.4	89.8	86.3	82.5	87.9	90.6	99.2	81.4	89.1	82.7
1919	95.0	97.5	93.6	91.4	96.4	96.7	99.1	90.1	93.8	91.6
1920	121.0	123.3	118.5	112.1	120.0	123.4	116.1	113.7	113.1	110.7
1921	113.3	116.5	110.5	105.0	104.1	115.3	99.4	107.4	103.2	106.7
1922	98.1	102.4	97.9	96.2	95.7	98.7	89.6	96.8	93.9	97.4
1923	116.5	120.9	115.4	110.2	110.2	119.0	104.9	112.6	109.4	111.7
1924	122.1	126.9	120.7	117.3	114.6	125.0	109.1	117.8	115.7	119.2
1925	118.4	123.6	117.9	116.3	113.2	120.9	107.0	115.6	114.4	118.1
1926	120.7	125.4	119.6	115.5	112.8	123.8	106.5	116.5	114.3	116.9
1927	118.1	122.7	116.7	113.5	110.1	121.2	105.4	113.5	112.5	116.0
1928	117.9	119.2	114.2	106.6	97.5	121.1	102.7	110.6	103.6	106.6
1929	117.7	118.1	112.3	104.0	97.2	119.0	98.6	106.2	100.4	103.8
1930	108.3	113.2	108.4	112.4	107.9	110.6	106.2	106.0	111.3	115.3
1931	130.3	108.4	104.0	108.0	102.9	105.6	102.8	102.1	107.8	110.5
1932	95.0	100.7	96.5	99.0	94.6	97.1	97.0	95.0	101.2	102.4
1933	87.3	94.0	90.1	97.9	93.2	88.4	96.8	90.2	99.6	102.8
1934	97.6	105.5	101.7	105.9	102.3	97.2	102.6	103.7	107.6	109.7
1935	91.6	99.7	96.4	104.2	99.3	90.7	101.8	98.9	105.7	108.6
1936	91.0	99.1	95.5	104.9	100.7	90.5	103.3	98.1	106.2	106.3
1937	98.2	106.5	103.2	113.1	111.1	97.8	114.8	106.0	117.0	117.6
1938	104.1	108.5	107.5	118.5	116.4	103.7	117.1	108.5	120.5	122.4
1939	107.0	110.2	109.9	118.7	116.4	107.6	114.3	110.3	119.2	119.8
1940	109.2	111.9	111.6	119.2	117.0	109.9	113.4	111.6	119.2	120.3
1941	117.0	118.7	118.5	121.1	120.2	120.1	116.7	116.3	122.1	121.5
SAN FRANCISCO AREA										
1926–29	87.7	93.7	90.4	97.5	96.5	86.1	95.5	91.8	95.9	99.0
1916	54.1	59.3	58.3	67.6	67.7	52.2	86.2	60.2	73.9	70.1
1917	63.0	67.7	67.8	77.2	81.9	61.7	118.7	68.0	94.6	78.1
1918	76.6	81.0	79.1	85.8	89.1	75.5	109.2	78.7	94.3	87.4
1919	87.8	92.7	90.1	96.7	100.1	87.2	112.1	89.7	102.2	98.5
1920	107.5	112.8	109.8	115.2	121.1	106.9	133.0	109.6	122.1	115.1
1921	89.5	96.8	93.8	102.3	100.2	86.3	106.5	97.2	103.8	105.6
1922	88.3	94.7	91.1	97.1	95.2	86.9	94.9	92.9	95.6	100.5
1923	98.7	104.8	100.8	103.1	103.0	98.8	103.5	100.8	103.1	106.4
1924	86.7	94.2	91.2	99.9	98.0	84.6	99.7	94.3	99.7	103.8
1925	86.5	93.9	91.1	99.5	97.9	84.1	97.0	93.4	98.0	102.1
1926	88.6	96.5	92.2	103.3	100.3	87.3	100.0	95.2	102.6	107.0
1927	87.2	94.8	91.2	102.1	98.3	86.1	97.2	93.1	100.5	103.3
1928	88.1	93.2	90.1	93.1	94.9	86.0	93.5	90.8	90.5	94.4
1929	86.9	90.3	88.1	91.9	92.5	85.0	91.3	88.1	90.0	92.3
1930	86.8	93.8	90.3	100.4	96.8	86.2	100.0	92.0	100.4	104.9
1931	80.6	88.8	85.6	94.6	90.6	79.2	92.5	87.3	94.8	100.7
1932	76.4	84.3	81.6	87.9	84.0	75.4	88.0	84.6	89.8	94.1
1933	68.4	76.7	74.3	84.7	81.0	66.3	82.1	78.5	85.3	89.5
1934	85.0	93.2	90.5	97.5	94.5	82.9	97.2	94.7	99.3	102.4
1935	84.1	91.6	89.0	96.5	94.9	82.1	99.9	92.9	99.8	103.7
1936	86.5	95.6	92.3	103.5	99.8	84.8	102.6	96.2	104.3	109.7
1937	96.7	104.3	101.9	112.2	109.8	95.4	113.0	104.8	113.3	116.0
1938	97.7	105.3	101.8	115.8	112.3	96.1	115.7	105.9	116.0	120.2
1939	99.2	105.7	104.5	117.4	114.4	97.6	114.9	107.4	116.5	121.9
1940	100.7	106.0	106.0	116.4	114.1	99.6	112.2	108.1	115.7	120.4
1941	112.2	115.8	116.2	120.1	119.8	114.3	120.9	115.3	123.4	123.0
SEATTLE AREA										
1926–29	84.5	92.2	89.2	101.7	95.1	82.4	100.8	92.2	100.5	105.9
1937	92.6	103.5	100.4	116.0	110.0	90.0	117.0	106.8	118.1	122.2
1938	96.5	104.3	103.5	119.8	115.7	94.0	120.2	107.6	120.8	125.6
1939	96.7	104.4	103.8	119.2	114.9	94.4	115.1	108.3	118.7	125.3
1940	99.0	106.2	105.5	119.1	115.1	97.2	112.8	109.4	117.7	124.9
1941	109.9	115.1	114.5	123.0	119.9	109.7	118.8	116.1	123.3	128.2

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See page 92, Apr. 27, 1939 issue for 1914, 1915 and 1916 data of long series.

For definition of this index see p. 129

PLANTS THAT MUST BE BUILT FAST CAN BE BUILT *FASTER* with SKILSAW TOOLS!

NEW plants, enlarged plants, remodeled plants—they're needed *FAST* for America's victory . . . they're finished *FASTER* when SKILSAW TOOLS are on the job, speeding up building each hour of each day. *Are skilled hands scarcer?* One hand with SKILSAW does the work of ten! *Is time too short?* SKILSAWS cut days from schedules . . . SKILSAW DRILLS punch holes in bottlenecks! *Do you want proof?* 9 out of 10 defense contractors use SKILSAW TOOLS! Ask your distributor for a demonstration.

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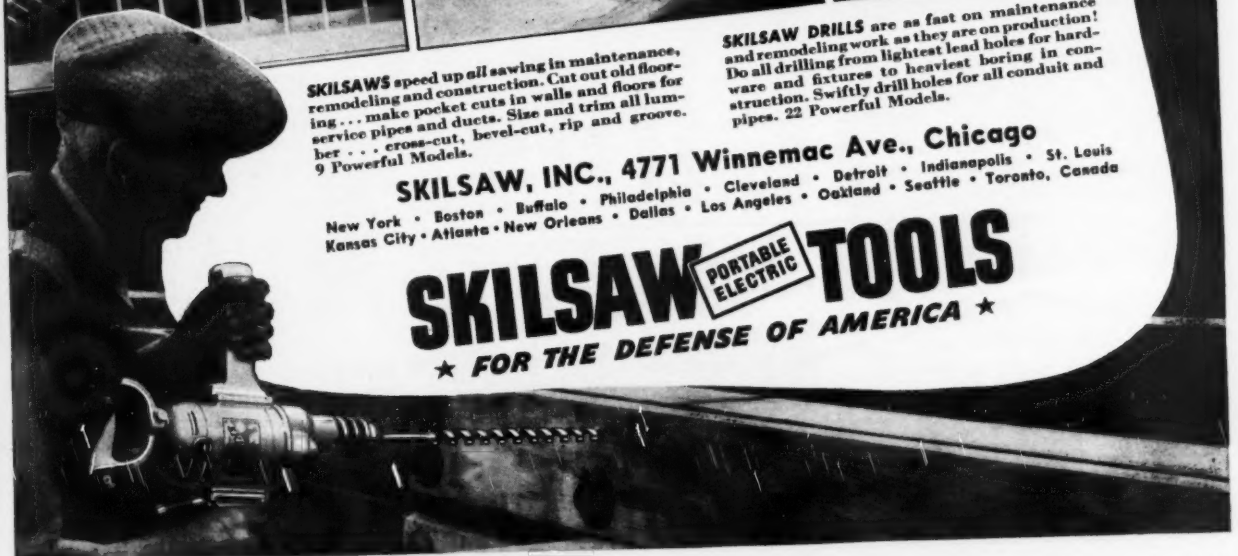

SKILSAWS speed up *all* sawing in maintenance, remodeling and construction. Cut out old flooring . . . make pocket cuts in walls and floors for service pipes and ducts. Size and trim all lumber . . . cross-cut, bevel-cut, rip and groove. 9 Powerful Models.

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★ FOR THE DEFENSE OF AMERICA ★

Cost of Financing

COST OF CONSTRUCTION money as measured by high-grade bond yields continued to decrease in 1941 for U. S. Treasury, state and municipal, railroad, industrial, and public utility bonds. Yields of municipals were 16 percent under the previous all-time low of a year ago, and treasury bond yields also reached a new low. Industrial and public utility bond yields were each down 2.5 percent, and railroads were off 3 percent.

The 1941 annual average yields for the various types of high-grade bonds in percent are: municipal, 2.10; industrial, 2.50; public utility, 2.69; and railroad, 3.16. The treasury yield average declined from 2.21 in 1940 to 1.95 percent in 1941.

After the declaration of war in December, bond yields, with the exception of railroads, climbed steadily. The March yield percentages for the various groups were: municipals, 2.58; industrials, 2.54; public utilities, 2.77; and railroads, 3.16 percent.

Commercial loan rates

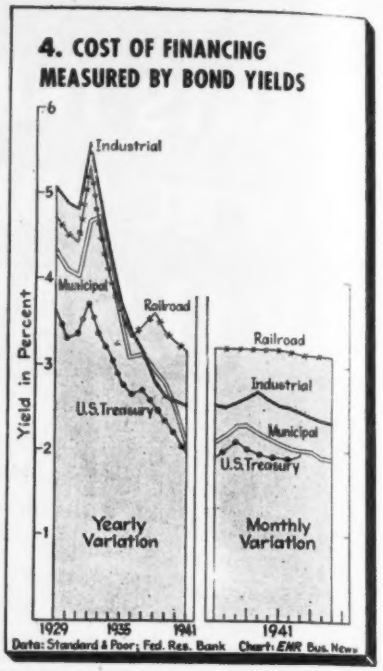
Commercial loan rates, or averages of rates charged by banks in principal cities turned downward in the last quarter of 1941. The year-end New York City rate was 1.88 percent, compared with 2.00 percent in the corresponding 1940 quarter. The rate for seven northern and eastern cities was 2.45, compared with 2.53 percent a year ago; and the rate in eleven southern and western cities was 2.99, as against 3.36 percent in the final quarter of 1940.

The 1941 fourth quarter average rate for the nineteen reporting cities stood at 2.41 percent, a drop of 0.18 percentage points from the preceding year's final quarter value.

Bond Yields—Percent

	U. S. Treas. (1)	Municipal (2)	Industrial (3)	Pub. Util. (4)	Railroad (5)
1933	3.31	4.71	4.98	4.69	4.55
1934	3.12	4.03	4.26	4.19	4.01
1935	2.79	3.41	3.73	3.59	3.58
1936	2.65	3.07	3.34	3.38	3.31
1937	2.68	3.10	3.16	3.22	3.45
1938	2.56	2.91	2.82	2.99	3.60
1939	2.36	2.76	2.64	2.83	3.39
1940	2.21	2.50	2.57	2.75	3.26
1941	1.95	2.10	2.50	2.69	3.16
1941 Jan	1.99	2.16	2.50	2.73	3.19
Feb.	2.10	2.27	2.55	2.73	3.19
Mar.	2.01	2.28	2.61	2.73	3.19
Apr.	1.96	2.20	2.68	2.78	3.18
May	1.92	2.14	2.58	2.73	3.18
June	1.91	2.08	2.53	2.71	3.18
July	1.90	2.03	2.50	2.66	3.16
Aug.	1.94	2.00	2.45	2.65	3.13
Sept.	1.94	1.99	2.41	2.64	3.13
Oct.	1.88	1.91	2.36	2.61	3.13
Nov.	1.85	1.90	2.33	2.59	3.13
Dec.	1.97	2.25	2.51	2.69	3.14
1942 Jan.	2.01	2.33	2.53	2.72	3.14
Feb.	2.09	2.55	2.50	2.75	3.16
Mar.	....	2.58	2.54	2.77	3.16

(1) Aver. all U. S. Treasury Bonds except those due or callable within 12 years; 1942 data for partially tax exempt issues.
(2) Standard Statistics & Poors—aver. 15 high-grade long-term municipals.
(3) Standard Statistics & Poors—aver. A1 plus industrials.
(4) Standard Statistics & Poors—aver. A1 plus public utilities.
(5) Standard Statistics & Poors—aver. A1 plus railroads.

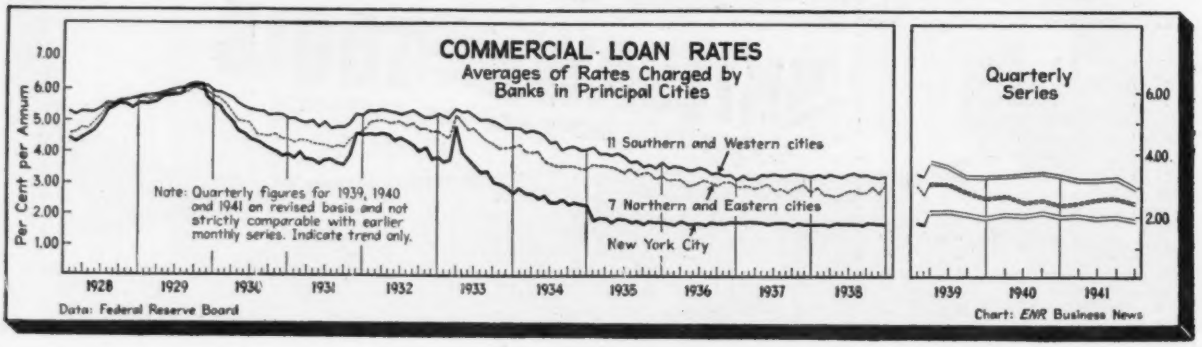


Rate of Interest

Municipal Bond Sales in the U. S. from Commercial & Financial Chronicle
(Millions of Dollars — 000,000 Omitted)

Year	2%	3%	3¼%	3½%	3¾%	4%	4¼%	4½%	4¾%	5%	5¼%	5½%	5¾%	6% & over	Not Known
1901	...	11	...	**69**	...	28	...	5	...	9	3	...	...	...	7
1902	...	12	...	**77**	...	34	...	4	...	10	2	...	...	...	8
1903	...	17	...	**55**	...	47	...	9	...	14	5	...	...	...	5
1904	...	13	...	**123**	...	75	...	12	...	20	4	...	...	...	4
1905	...	6	...	**81**	...	55	...	14	...	19	6	...	...	...	3
1906	...	17	...	19	...	**120**	...	15	...	17	7	...	...	...	6
1907	...	9	...	8	...	**98**	...	69	...	26	8	...	...	...	9
1908	...	8	...	10	...	**124**	...	104	...	42	13	...	...	...	11
1909	...	21	...	17	...	**163**	...	49	...	55	25	...	...	...	10
1910	...	15	...	17	...	**95**	...	53	...	45	31	...	...	...	63
1911	...	2	...	7	...	**127**	...	89	...	65	29	...	...	...	78
1912	...	3	...	5	...	**101**	80	87	...	68	32	...	...	...	10
1913	...	19	...	4	...	80	20	**132**	...	108	31	...	...	...	10
1914	...	15	...	...	...	72	77	**153**	...	108	40	...	...	...	11
1915	...	2	...	...	...	85	46	**192**	...	117	44	...	...	...	12
1916	...	2	...	1	...	**125**	80	105	...	92	38	...	...	...	13
1917	...	9	...	1	...	96	16	**150**	...	120	42	...	...	...	18
1918	...	2	...	...	...	19	4	69	...	**98**	74	...	...	...	30
1919	...	4	...	...	...	19	22	132	28	**278**	150	...	...	...	59
1920	...	...	...	15	...	24	3	71	9	194	**333**	...	...	...	34
1921	...	...	...	...	...	53	3	125	36	330	**656**	...	...	...	26
1922	...	1	...	...	...	105	131	219	56	**307**	252	...	...	...	32
1923	...	...	...	...	...	98	102	**272**	138	237	203	...	...	...	13
1924	...	...	4	...	...	150	**339**	291	109	281	203	...	...	...	22
1925	...	...	1	...	...	270	302	**318**	76	202	201	...	...	...	30
1926	...	...	...	...	...	212	287	**342**	76	215	199	...	...	...	35
1927	...	16	10	...	...	**361**	321	336	79	180	160	...	...	...	46
1928	...	...	37	...	...	365	**384**	281	68	150	111	...	...	...	19
1929	...	3	65	...	...	107	133	**449**	132	250	281	...	...	...	10
1930	...	2	60	...	...	338	326	**341**	150	155	97	...	...	...	18
1931	...	92	...	181	...	241	**311**	197	51	99	77	...	...	...	6
1932	...	31	...	19	...	68	56	151	73	122	**322**	...	...	...	7
1933	...	32	15	29	39	**131**	48	51	22	61	3	20	3	52	15
1934	84	107	94	54	72	**197**	54	75	41	88	13	23	4	13	20
1935	161	**349**	62	137	71	234	40	50	22	26	3	3	2	9	50
1936	211	**343**	71	156	35	212	14	23	3	16	1	1	...	2	28
1937	73	**422**	55	95	50	134	26	13	3	7	1	1	...	1	21
1938	**360**	256	105	102	54	149	21	11	8	8	3	...	1	1	20
1939	**446**	282	80	58	30	128	71	8	2	4	...	1	...	1	15
1940	437	**446**	84	80	55	90	16	8	1	2	...	...	...	1	14

Bold face type indicates interest rates on which bulk of financing was done for year.



3 ways to make your Wire Rope dollar go farther...conserve steel tonnage too

(No. 9 in a series of informative articles for wire rope users prepared by the Macwhyte Wire Rope Company. Previous articles in this series are available on request on your company letterhead.)

1 Buy PREformed; it's best, costs less

There have always been sound reasons for buying PREformed wire rope. Careful tests time and again have proved it gives better service than non-preformed, costs less in the long run, saves time because fewer shutdowns are necessary for replacements.

Fig. A—PREformed ropes are free of internal stress, have high fatigue resistance.

Today there's another reason why it's most important to buy PREformed: by doing so you help national defense.

It takes just as long at the steel mill to make steel for non-preformed as for PREformed wire rope. Yet PREformed will outlast ordinary wire rope on most jobs. When you buy Macwhyte PREformed, therefore, you're helping conserve not only steel which America greatly needs, but also the time of those who make it.

2 Install Rope Carefully

It's so easy to kink or twist rope when installing in a hurry. Such "haste makes waste." Kinking and twisting definitely shortens rope life.

With reasonable care and speed you can prevent both. Here are some simple suggestions on unreeling and uncoiling rope . . . operations where both kinking and twisting are apt to occur.

CORRECT WAY

Unreeling—The reel should be revolved and the rope taken off the way it is put on the reel. Illustration No. 1 shows one method—put a shaft through the center of the reel and jack it up so that the reel will revolve freely. Pull the rope straight ahead, keeping it taut to prevent it from loosening up on the reel. A board held against one flange may be used as a brake to keep the reel from revolving too fast.

Uncoiling—Roll the coil along the ground so the rope lies straight as shown in Illustration No. 2. There will be no twist or kink in the rope if these instructions are followed.

INCORRECT WAY

Illustrations 3 and 4 show incorrect ways of unreeling and uncoiling. Notice that the reel and coil cannot revolve and therefore the rope is twisted as each turn is taken off.

3 Inspect Your Ropes Regularly

Once wire rope is on their equipment many users overlook the value of regular inspection. Such negligence is costly. It can be avoided by regular inspection which takes far less time, is much less expensive than too frequent buying and replacing for lack of knowledge of their condition.

Pictured here are a few of the most common "Wire rope enemies" which, if *not* eliminated or kept under control, can easily reduce the service life of your rope as much as 50%. Also given here are suggested methods of avoiding these dangers.

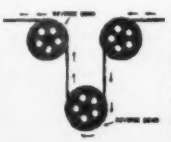


Fig. B—Reverse bends—Years of experience and many tests have proved that reverse bending and excessive wire fatigue reduce rope life as much as 50%.

Where reverse bending cannot be eliminated, use the largest sheaves possible and place them as far apart as possible. By getting the MAXIMUM distance between reverse bends, you reduce fatigue—provide longer service.

Fig. C—Sheaves too small. This rope was forced to travel continuously over sheaves whose diameters were too small. Frequent inspection would have shown this danger. A change to a larger sheave would have solved the problem. (Note: PREformed wire rope would have lasted much longer in this case.)

Fig. D—Drum abrasion and abuse caused this. The rope was scuffed over and over against previous wraps on a flat-faced drum. This could have been prevented by even winding and grooved drums.

Fig. E—Kinking caused this. This dog-leg, or kink, was finally straightened out . . . but notice the uneven wear at the point where the kink had been. Proper handling during installation could have prevented this. Beware of dog-legs! They're expensive.

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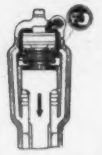
Thor short travel tubular valve boosts output, speeds work



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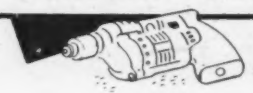

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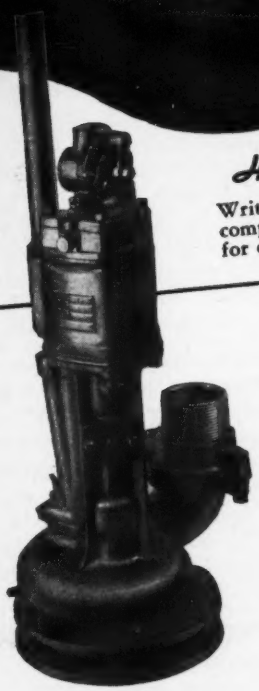

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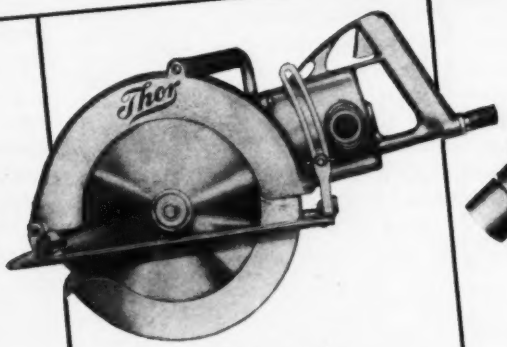

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Accuracy and Flexibility with Tailor-Made Indexes

Curtis A. Mees

Consulting Engineer, Atlanta, Ga.

***Contents in Brief**—Cost indexes constructed to fit a property's accounting structure offer special purpose technique for "reproduction-new" valuations that overcome deficiencies of general cost indexes.*

THE APPLIED INDEX method of valuation described in this article involves first an audit of the owner's cost records of the property to be valued in order to set up the pertinent units for which detailed costs of original construction and installation are known. Then a series of applied indexes are fitted to this cost structure, which can project it forward to determine Reproduction Cost New for any desired date of inquiry. By building up these applied indexes through four stages, "basic," "derived," "composite" and "applied," great accuracy and flexibility are achieved.

Basic Indexes—The process first involves the collection of simple or basic index numbers, that is, those relating to only a single item, usually quoted at point of origin. These may be found in technical publications, such as *Engineering News-Record*, the steel magazines, lumber publications, in publications of various governmental or commercial bureaus, and in more or less private records of manufacturers or dealers. The author's bibliography contains over 300 references, one of which, *Wholesale Prices*, published by the U. S. Department of Labor, contains at the present time over 850 basic indexes in 62 general groupings.

Each commodity may have several or even many separate indexes, some complete, others covering only short periods of time. These should be grouped, analyzed, weighted and harmonized for the adoption of a single adjusted index for each basic item required, and referred to an index of 100 for the date of inquiry.

A rather special type of index covers labor costs. Wage indexes for skilled, semi-skilled or common labor may readily be found for the locality in question but, inasmuch as productivity is just as important a cost factor as rates, and labor output is known to vary through the years, these indexes should be adjusted for this variable.

Having adopted satisfactory basic indexes these must be combined in proper proportions to cover all units of construction, and finally the structure as a whole or even an entire plant or system.

The manner of expansion of indexes varies, but a simple general procedure is illustrated by developing an index for a plant unit.

Derived Indexes—Let us assume that the plant unit to be valued as of July 1, 1936, is a high-tension steel tower transmission line carrying a double circuit of 4/o aluminum strand and two ground wires.

From a known record established in 1914, one bare galvanized steel tower, f.o.b. destination, cost the following:

Material	$55.15
Shop Labor	39.57
Freight	5.28
Total	$100.00

TABLE 1—COMPUTATION OF DERIVED INDEX FROM BASIC INDEXES

Item Galvanized Steel Tower (a)	Known Cost in 1914 (b)	Indexes for 1914 (c)		Derived Cost 7-1-1936 100 b/c	Derived Index 1936 = 100 (e) Proportionate Cost in Percent
Galvanized shapes	$55.15	Basic	72	$76.00	45.00
Fabrication (labor)	39.57	Basic	46	86.02	50.54
Freight	5.28	Basic	69.5	7.60	4.46
	$100.00	Derived	58.75	$170.22	100.00

For these elements of cost, now select the simple basic indexes for galvanized structural shapes at the mill, industrial labor and freight rates, which can now readily be combined, as shown in Table 1, to yield a derived index, so called because it still represents only a single structural item, albeit one delivered at a specific transportation terminus.

To complete the index for any or all intervening years it is only necessary to multiply the pertinent prevailing indexes by the cost proportion found for index equals 100. Thus, for a delivered tower in 1914, the index equals 72 × .45 plus 46 × .5054 plus 69.5 × .0446 which equals 58.75 and corresponds to the cost ratio of 1914 to July 1, 1936, or

$$\frac{100.00}{170.22} = 58.75 \text{ percent.}$$

Now the intervening years can be filled in without known costs for those years. For example, if the basic indexes for 1920 are 162.0, 93.5 and 104.5 respectively, by applying the proportionate costs as for 1914 the derived index for 1920 is 124.82.

Composite Index—From this determination one may now expand the index to cover the reproduction cost of an erected double-circuit steel tower line one mile long, exclusive of conductors and right-of-way, using the now-established derived index for the tower and basic indexes for the remaining items as shown in Table 2.

The 1906 index, therefore, equals

$$\frac{2,274.00}{4,475.05} \text{ or } 50.82 \text{ percent.}$$

This index is designated, for differentiation, a composite index. It now represents a structural item to which must be added conductors before it becomes a plant item. The process has been carried thus far without including conductors because

The Electric Hoist That Paid for Itself in Two Years

An $18,000 Investment Saved $9000 a Year and Got More Production

by H.W. CHADBOURNE
Industrial Department,
General Electric Company

THE Blue Diamond Coal Company of Bonny Blue, Va., had the problem of lowering coal down a steep mountain side. The slope was 3700 feet long; the average pitch 26.6 per cent; about a 950-foot drop.

First, gravity was used—the force of the downgoing loads hauling up the empty cars. However, this proved unsatisfactory. There were wrecks and derailments, costing the company valuable production time and money. Another method was needed.

A study of the problem convinced the company's officials that it would be economical to invest approximately $18,000 to operate the hoist electrically. The results were even better than expected. The net saving due to the return of power to the line is about $7.00 a day, or $1462 a year.

But a still larger saving comes from the gain in production because of the absence of wrecks. This amounts to about $7550 a year, or a total saving of $9000 a year. Thus in two years the equipment paid for itself in money, and a great deal more in satisfaction.

Under the gravity system, there were several handicaps. All power generated by the downgoing loads had to be dissipated in the mechanical brakes and in lifting the empty car. This caused over-heating, excessive wear, and lack of accurate control, often ending in derailments and wrecks, with consequent loss of time and money.

600-hp, G-E induction motor operates hoist on this slope.

Another handicap was that the slope had a section near the middle which was almost level. This made it necessary to have the downgoing car travel at high speed on entering this section in order to haul the upcoming car during the same period. The maximum speed was 3000 feet per minute. Such high speed contributed to many wrecks.

Another fault of the gravity system was that, if the car was not fully loaded, it would start slowly and might not maintain enough speed to complete the trip. It could not be speeded up. If lower speed were required at any point along the way, mechanical brakes had to be used.

The electric equipment purchased for the change-over consists of a 600-hp, 900-rpm wound-rotor induction motor with reversible magnetic control. It operates as follows:

When the downgoing car is loaded, the brakes are released and it starts by gravity. An indicating tachometer shows the speed. As soon as the motor has reached full speed, it is thrown across the line. The over-hauling load tends to drive the motor slightly above synchronous speed.

Under that condition, the motor automatically becomes a generator and returns energy to the line. To increase the speed of the downgoing car, resistance may be cut into the rotor circuit by means of a controller.

When the car approaches the landing, the controller is quickly thrown to the OFF position, and then two or three notches to the reverse, thus bringing the entire system to rest.

When the motor is operating as a motor, it takes as much as 700 hp from the line. When regenerating, it pumps power back into the line—as much as 1000 hp at certain periods during each trip. The net return is 550 kw-hr a day.

***This is another example** of how General Electric engineers can help solve your construction problems. Their skill, plus G-E equipment, will likely bring about the best possible solution. If you have a problem, just get in touch with our nearest office. General Electric, Schenectady, N. Y.*

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TABLE 2—COMPOSITE INDEX COMPUTED FROM BASIC AND DERIVED DATA

Item Erected, double steel tower line exclusive of conductors (a)	Known Cost in 1906 (b)	Indexes for 1906 (c)		Composite Cost 7-1-1936 (d)	Composite Index 1936 = 100 (e) Proportionate Cost in Percent
Towers (12.32 per mi.)	$1,343	Derived	64.0	$2,098.44	46.892
Pin insulators	180	Basic	94.5	190.48	4.256
Misc. steel	54	Basic	83.0	65.06	1.454
Concrete materials	27	Derived	62.0	43.55	0.973
Skilled and common labor	670	Derived	32.25	2,077.52	46.425
	$2,274	Composite	50.82	$4,475.05	100.000

these may be of various specifications for the same kind of tower.

Applied Index—The index for this bare tower line can now be expanded, as shown in Table 3, to include the erection thereon of the particular conductors specified:

For a check, $54.2 \times .63602 + 153.5 \times .1763 + 95.5 \times .01786 + 34.5 \times .16973 = 69.1$; and likewise

$$\frac{4,864.00}{7,035.94} = 69.1.$$

This index covers a definite plant item and on that account it is called an applied index.

It may be noted that right-of-way has not been included. In the author's practice this is usually included on the basis of original cost at an index of 100 for all years.

Similarly, applied indexes must be built up for every plant item embraced in the inventory of the property to be valued.

For the valuation of a particular electric utility system, the author found it necessary to prepare 113 basic, 59 derived and 109 composite indexes, besides 37 indexes pertaining solely to construction plant. These were then utilized to produce 137 applied indexes for plant units actually embraced in the system. The labor involved was obviously great; however, for any similar work, these same indexes may safely be used again if adjusted to locale and brought up to date of inquiry.

Certain indexes were developed to adjust them to reflect mechanization of construction, as this occurs in excavation, concrete construction, machine pole setting, etc. In these cases, annual unit costs were computed from known performance, and regular indexes were plotted. Then superimposed on these graphs were similar costs obtained from contractors' bids made over the span of years. Then the two cost series were harmonized as well as possible.

An illustration of the manner in which applied indexes are employed to build up a final index for a complete hydro-electric plant is presented in Tables 4 and 5.

Table 4 sets forth the cost accounting made on this plant as of 1924, and for each of these units appropriate indexes were built up using the technique shown herewith for developing applied index for a steel tower transmission line. Several of these primary units embraced a considerable number of individual construction items, for each of which separate indexes were prepared. Thus, for powerhouse equipment, eight items were considered, i.e. turbines, generators and exciters, switchboard, L.T. circuit breakers, station transformers, wiring, crane and motor generator sets. Village and yard covered sixteen secondary items such as grading, sodding, roads and paving, wells, pumps, filters, septic tank, piping for water, sewers and drains, lighting system, fencing and fire protection, etc. From these primary unit indexes there was transferred to this table the 1924 index which was used to compute reproduction cost new at July 1, 1936 as shown.

If it is not required to determine indexes for the intervening years the task is completed. If, however, it is desired to obtain index figures for intermediate years, which may be essential for consideration of annual additions and betterments, the process entails determination of the proportionate cost for every item at index equals 100, or at July 1, 1936. These percentages are also shown in Table 4.

It will be noted that costs have been grouped to obtain totals with and without certain inclusions. This segregation shows the flexibility of the process for arriving at figures which might be more directly adaptable for presentation of valuation totals as evidence.

The index for the terminal contains, itself, six different composite indexes for the following erected

TABLE 3—COMPUTATION OF APPLIED INDEX FROM COMPOSITE, DERIVED AND BASIC INDEXES

Item	Known Cost in 1907	Indexes for 1907		Applied Cost at 7-1-1936	Applied Index 1936 = 100 Proportionate Cost in Percent
Bare tower line	$2,427	Composite	54.2	$4,475.05	63.602
4/0 alum. conductor	1,905	Basic	153.5	1,241.04	17.639
S. M. grounds	120	Basic	95.5	125.65	1.786
Labor	412	Derived	34.5	1,194.20	16.973
	$4,864	Applied	69.1	$7,035.94	100.000

TABLE 4—CONSTRUCTION COST, TURNER STATION COMPLETED IN 1924

Reference Number Table 5	Item	Original Cost 1924	Applied Index 1924	Computed Cost 7-1-1936	Proportion of Total Cost at Final Inde 1936 = 100	Reference Number Table 5
1	Reservoir Clearing	$17,490	81.5	$21,460	2.526	2
3	Earth Excavation	43,627	90.5	48,207	5.674	4
5	Rock Excavation	37,079	92.5	40,085	4.718	6
7	Unclassed Excavation	22,175	91.5	24,235	2.852	8
9	Cofferdams	2,229	94.0	2,371	0.279	10
11	Multiple Arch Dam	98,554	93.0	105,972	12.473	12
13	Gravity Section	185,031	100.0	185,031	21.777	14
15	Racks	1,437	118.0	1,218	0.143	16
17	Gates and Hoists	29,385	100.0	29,385	3.459	18
19	Cradles, etc	81,726	106.0	77,100	9.074	20
21	Penstocks	29,447	107.0	27,521	3.239	22
23	P. H. Substructure	45,428	96.5	47,076	5.541	24
25	Draft Tube Royalty	3,000	100.0	3,000	0.353	26
27	P. H. Superstructure, etc	28,649	122.0	23,483	2.764	28
29	P. H. Equipment	118,637	78.0	152,099	17.901	30
31	Shop Equipment	1,979	97.0	2,040	0.240	32
33	Cottages	22,216	127.0	17,493	2.059	34
35	Village and Yard	15,727	94.0	16,731	1.969	36
37	Bridge	5,349	99.5	5,376	0.633	38
39	Hauling	16,898	85.5	19,764	2.326	40
41	Sub Totals	$806,063	94.87	$849,647	100.000 = 84.768	42
43	Interest dur. Constr.	76,699	129.5	59,227	5.907	44
45	Land	93,500	100.0	93,500	9.325	46
47	Sub Totals	$976,262	97.39	$1,002,374	92.974 = 100.00	48
49	Trans. Terminals	72,720	96.0	75,750	7.026	50
51	TOTALS	$1,048,982	97.30	$1,078,124	100.000	

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items: steel structure, power transformers, high tension oil circuit breakers, switchboard, miscellaneous equipment and wiring.

In Table 5 there are shown each of these separate cost items with its complete special or applied indexes which if multiplied by the percentage of inclusion at 100 produces its part of the total index figure for any one year.

The odd number columns contain the unit indexes and the even columns the applicable proportions, which if added up total the final index recorded in columns 41, 47 and 51, respectively, for portions of the complete plant.

Some slight discrepancies appear in these figures because originally indexes to the nearest tenth were used, whereas in this abstract they were used to the nearest half percent.

This applied index method of valuation involves an audit of the cost records of the property owner for challenge and elimination of improper entries to insure that the purged record includes only every legitimate charge to fixed capital. The cost indexes prepared, as herein outlined, then are made to conform to those pertinent units for which detail costs have been set up and may be applied to determine Reproduction Cost New at date of inquiry or for any intermediate date from time of original construction.

For this method of valuation as opposed to the conventional priced inventory method the author claims the following advantages:

1. It more nearly approaches accuracy in that it reflects true variation in price levels.
2. It reflects faithfully every circumstance under which the property was actually built and includes all construction involved whether permanent or temporary, visible or invisible.
3. It conforms best to legal requirements in that the identical property is valued in modernized makeup on the basis of evidence secured through neutral sources and susceptible of ready verification.
4. It can be made more up-to-date because it can be completed in a fractional part of the time required for making the conventional appraisal.
5. It is considerably less costly.

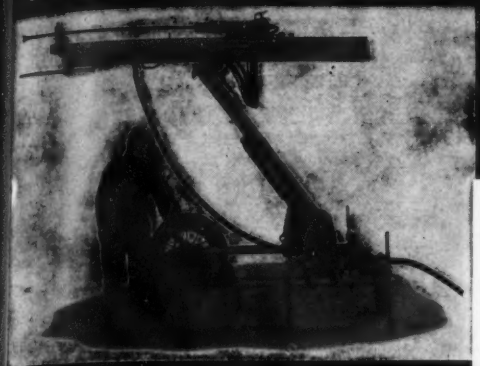
TABLE 5—APPLIED AND FINAL INDEX SERIES, TURNER HYDRO-ELECTRIC STATION—COMPLETED IN 1924

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Year	Res. Clearing	X.02526	Earth Excav.	X.05674	Rock Excav.	X.04718	Unclass. Excav.	X.02852	Coffer-dams	X.00279	Mult. Arch Dam	X.12473	Gravity Section	X.21777	Racks	X.00143	Gates and Hoists
	81.5	2.06	90.5	5.13	92.5	4.36	91.5	2.61	94.0	0.26	93.0	11.60	100.0	21.78	118.0	0.17	100.0
1925	78.5	1.98	88.5	5.02	90.5	4.27	89.5	2.55	92.5	0.26	91.5	11.41	95.0	20.69	111.5	0.16	101.5
	83.0	2.10	92.0	5.22	94.0	4.43	93.0	2.65	95.5	0.27	94.0	11.72	97.0	21.12	110.5	0.16	104.0
	80.0	2.02	92.5	5.25	94.0	4.43	93.25	2.66	94.5	0.26	93.0	11.60	96.0	20.91	106.0	0.15	102.5
	82.0	2.07	96.0	5.45	97.5	4.60	96.75	2.76	97.5	0.27	95.5	11.91	97.0	21.12	104.5	0.15	105.0
	84.5	2.13	98.0	5.56	99.0	4.67	98.5	2.81	99.0	0.28	97.0	12.10	97.5	21.23	106.0	0.15	106.5
1930	81.5	2.06	96.0	5.45	97.0	4.58	96.5	2.75	96.5	0.27	94.5	11.79	95.5	20.80	99.5	0.14	104.5
	66.0	1.67	88.5	5.02	89.5	4.22	89.0	2.54	87.0	0.24	85.5	10.66	86.0	18.73	95.5	0.14	103.0
	65.0	1.64	83.0	4.71	84.0	3.96	83.5	2.38	79.0	0.22	79.5	9.92	80.5	17.53	93.5	0.13	89.5
	68.5	1.73	87.5	4.96	87.5	4.13	87.5	2.50	86.0	0.24	86.0	10.73	86.5	18.84	93.0	0.13	91.0
	95.5	2.41	99.5	5.65	99.0	4.67	99.25	2.83	97.5	0.27	98.0	12.22	98.0	21.34	99.0	0.14	94.5
1935	97.5	2.46	99.0	5.62	99.0	4.67	99.0	2.82	99.0	0.28	98.5	12.29	98.5	21.45	100.0	0.14	96.5
7-1-36	100	2.53	100	5.67	100	4.72	100	2.85	100	0.28	100	12.47	100	21.78	100	0.14	100

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Year	X.03459	Cradles etc.	X.09074	Pen-stocks	X.03239	P. H. Substr.	X.05541	Draft Tube Royalty	X.00353	P. H. Superstr. etc.	X.02764	P. H. Equip.	X.17901	Shop Equip.	X.00240	Cot-tages	X.02059
	3.46	106.0	9.62	107.0	3.47	96.5	5.35	100	0.35	122.0	3.37	78.0	13.96	97.0	0.23	127.0	2.61
1925	3.51	102.0	9.26	104.5	3.38	95.0	5.26	100	0.35	119.0	3.29	77.5	13.87	97.0	0.23	124.0	2.55
	3.60	102.5	9.30	103.5	3.35	97.0	5.37	100	0.35	118.5	3.28	76.0	13.60	100.0	0.24	126.0	2.59
	3.55	101.5	9.21	103.0	3.34	96.0	5.32	100	0.35	118.0	3.26	76.5	13.69	100.5	0.24	126.0	2.59
	3.63	101.5	9.21	105.0	3.40	97.0	5.37	100	0.35	116.5	3.22	79.5	14.24	101.5	0.24	127.5	2.63
1930	3.68	102.0	9.26	107.0	3.47	97.5	5.40	100	0.35	115.5	3.19	88.0	15.75	104.0	0.25	121.5	2.50
	3.61	100.0	9.07	101.5	3.29	95.5	5.29	100	0.35	108.5	3.00	87.5	15.66	102.5	0.25	118.0	2.43
	3.56	89.0	8.08	96.5	3.13	86.0	4.77	100	0.35	96.5	2.67	84.5	15.13	99.5	0.24	107.5	2.21
	3.10	77.0	6.99	89.0	2.88	80.5	4.46	100	0.35	87.5	2.42	81.5	14.59	95.5	0.23	94.5	1.95
	3.15	84.0	7.62	89.5	2.90	86.5	4.79	100	0.35	86.5	2.39	87.0	15.57	95.0	0.23	92.0	1.89
1935	3.27	97.0	8.80	96.0	3.11	98.0	5.43	100	0.35	97.0	2.68	96.0	17.18	100.0	0.24	99.5	2.05
	3.34	96.0	8.71	97.0	3.14	98.5	5.46	100	0.35	97.5	2.69	99.0	17.72	101.0	0.24	99.0	2.04
7-1-36	3.46	100	9.07	100	3.24	100	5.54	100	0.35	100	2.76	100	17.90	100	0.24	100	2.06

	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Year	Vil-lage and Yard	X.01969	Bridge	X.00633	Haul-ing	X.02326	Power Plant	X.84768	Interest during Constr.	X.05907	Land	X.09325	Com-plete Plant	X.92974	Trans. Ter-minal	X.07026	Plant and Ter-minal
	94.0	1.85	99.5	0.63	85.5	1.99	94.87	80.41	129.5	7.65	100	9.33	97.39	90.55	96.0	6.74	97.29
1925	91.5	1.80	98.5	0.62	83.5	1.94	92.40	78.33	125.0	7.38	100	9.33	95.04	88.36	94.5	6.64	95.00
	94.0	1.85	99.5	0.63	86.5	2.01	93.79	79.50	125.0	7.38	100	9.33	96.21	89.45	93.5	6.57	96.02
	93.0	1.83	100.5	0.64	84.5	1.97	93.27	79.09	124.5	7.35	100	9.33	95.77	89.04	90.5	6.36	95.40
	94.0	1.85	103.5	0.66	85.5	1.99	95.12	80.61	123.0	7.27	100	9.33	97.21	90.38	89.0	6.25	96.63
	95.5	1.88	105.5	0.67	87.0	2.02	97.35	82.56	122.0	7.21	100	9.33	99.10	92.14	93.5	6.57	98.71
1930	92.5	1.82	103.0	0.65	85.5	1.99	95.25	80.78	117.0	6.91	100	9.33	97.02	90.20	92.0	6.46	96.66
	82.5	1.62	99.0	0.63	71.5	1.66	87.27	74.00	108.0	6.38	100	9.33	89.71	83.41	87.5	6.15	89.56
	77.5	1.53	90.0	0.57	71.0	1.65	81.21	68.83	99.5	5.88	100	9.33	84.04	78.14	84.0	5.90	84.04
	81.0	1.59	93.0	0.59	72.5	1.69	86.02	72.90	97.0	5.73	100	9.33	87.96	81.78	89.5	6.29	88.07
	96.0	1.89	96.5	0.61	92.5	2.15	97.29	82.48	100.0	5.91	100	9.33	97.72	90.85	96.5	6.78	97.63
1935	98.5	1.94	97.5	0.62	98.5	2.29	98.27	83.33	100.0	5.91	100	9.33	98.57	91.64	99.0	6.96	98.60
7-1-36	100	1.97	100	0.63	100	2.33	100	84.77	100	5.91	100	9.33	100	92.97	100	7.03	100

ALL THE Same DRILL!



DR30 drills a flat hole 8 feet above ground level.

Set for drilling a low, flat hole.

Set for drilling a high hole, angling upward.

THE varied positions taken by the DR30 machine illustrated here are only a very small part of the settings possible with this latest Cleveland wagon drill. The DR30 has the double screw U-bar jack — the recoil device (it increases cutting speed) — the improved centralizer — the forward leg point, to steady the drill — all the important features of the older designs, with the improvements that make the Cleveland DR30 the most popular wagon drill ever built. • Ask for new Bulletin 132 — just off the press. It tells the whole story.

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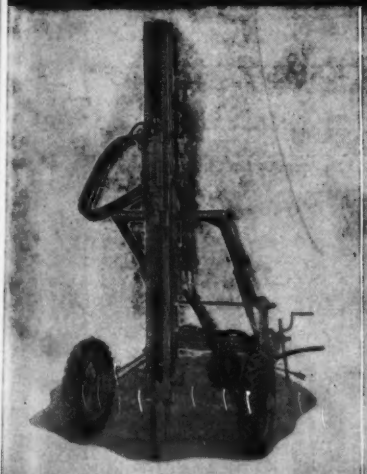
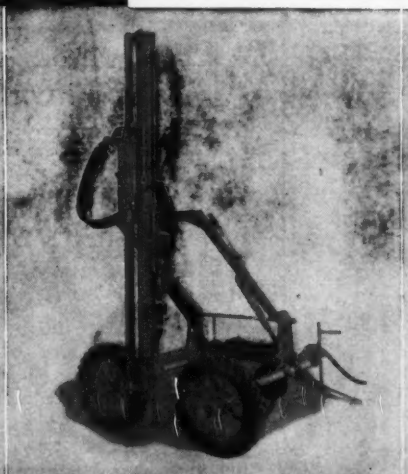


Cleveland DR30 has a "slabback" mounted drifter, double screw U-bar.



Note how the wheels can be swiveled.

Another position of the wheels and drill.

Base Rates on Compensation Insurance for Construction—April 1, 1942

Data compiled by Herbert L. Jamison & Co., Insurance Brokers, New York, N. Y.

Classification of Work (A)	Ala.	Ariz.	Ark.	Cal.	Colo.	Conn.	Del.	D. C.	Fla.	Ga.	Idaho	Ill.	Ind.	Iowa	Kan.	Ky.	La.	Me.	Md.	Mass.	Mich.	Minn.	Miss.(E)	Mo.	Mont.	Neb.
1. Boiler installation	2.97	8.43	11.80	5.06	5.37	4.29	3.05	5.65	3.85	3.59	4.39	3.90	3.08	3.49	4.25	4.09	8.72	4.30	4.42	5.14	6.05	5.25	9.35	6.62	5.03	6.25
2. Carpentry, private residences only	2.30	4.09	6.03	5.56	3.71	2.33	2.85	3.73	3.66	1.92	3.38	3.59	2.85	3.37	2.81	3.10	5.45	2.63	2.87	2.68	5.61	4.79	2.86	5.39	3.85	4.33
3. Carpentry, dwellings — 3 stories or less	2.30	9.16	6.03	5.56	3.71	2.33	2.85	3.73	3.66	1.92	3.38	3.59	2.85	3.37	2.81	3.10	5.45	2.63	2.87	2.68	5.61	4.79	2.86	5.39	3.85	4.33
4. Carpentry, general	3.33	9.16	9.61	5.56	4.24	5.58	2.85	4.72	3.66	5.53	5.55	5.62	4.83	3.38	4.73	4.06	6.22	5.35	5.09	8.23	5.59	4.79	11.50	5.39	6.33	6.66
5. Carpentry, interior trim	1.17	9.16	3.25	5.56	2.08	1.69	2.85	2.27	1.42	1.44	1.64	1.73	1.35	1.34	1.68	1.53	2.52	1.71	1.72	1.84	1.91	4.79	1.99	5.39	1.86	2.41
6. Cement work, sidewalks, drives, etc.	1.27	2.59	3.47	2.02	2.23	2.11	2.55	2.19	1.58	1.57	2.06	1.93	1.38	1.67	1.81	1.61	2.71	1.85	1.81	2.45	1.91	2.01	2.61	2.86	2.33	2.59
7. Concrete constr.— monolithic bridges (B)	6.06	14.26	16.98	9.18	9.23	8.69	3.90	9.81	6.04	6.57	L	5.34	7.02	8.12	7.28	7.36	12.22	10.10	7.78	18.36	10.07	8.65	15.87	15.03	9.99	12.43
8. Concrete constr.— non-monolithic bridges (B)	3.78	14.26	11.47	9.18	4.77	6.01	3.90	4.54	5.08	3.42	5.50	4.40	3.44	3.83	4.89	4.77	8.51	5.36	5.26	18.36	6.61	5.44	9.71	7.65	5.73	8.63
9. Concrete constr., general (B)	3.78	8.43	10.85	5.20	4.77	6.01	3.90	4.54	5.08	3.42	5.50	4.40	3.44	3.83	4.89	4.77	8.51	5.36	5.26	18.36	6.61	5.44	9.71	7.65	5.73	8.63
10. Concrete constr.— dwgs. to 3 stories — (not mono.)(B)	1.91	8.43	4.55	5.20	2.99	3.31	3.90	4.09	2.20	1.94	2.68	2.62	1.92	1.90	2.52	1.78	3.73	3.77	3.48	6.27	2.98	1.47	6.83	4.26	3.02	3.21
11. Electrical equipment installation	1.91	4.59	5.27	3.37	3.31	3.05	1.35	3.37	2.38	2.63	3.19	2.56	2.11	2.51	2.66	2.35	3.73	2.62	2.44	3.44	3.41	3.76	5.09	4.82	3.80	3.95
12. Electric wiring — within buildings	1.10	2.68	2.91	2.57	1.94	1.76	.90	2.25	1.77	1.55	1.86	1.54	1.30	1.41	1.57	1.45	2.25	1.59	1.75	1.68	1.56	2.14	2.40	2.18	2.09	2.28
13. Excavation — earth (C)	1.96	7.76	5.09	4.63	7.77	4.75	2.60	4.62	2.68	2.10	5.74	3.31	2.22	2.83	4.15	2.46	3.78	4.35	4.77	5.53	3.53	4.20	5.34	7.63	6.55	4.76
14. Excavation — rock (D)	3.26	11.98	9.22	12.82	5.90	6.11	2.60	7.00	4.06	3.87	6.15	4.92	3.77	4.12	4.67	4.55	.....	4.67	4.89	9.14	6.21	5.67	9.93	7.44	7.02	L
15. Glazing	2.84	6.29	7.92	5.93	5.10	4.61	1.45	5.42	3.69	3.44	4.95	4.06	3.28	3.69	4.06	3.84	6.00	4.11	4.15	4.15	4.51	5.04	3.71	5.94	5.61	5.93
16. Lathing	1.56	4.06	4.37	5.15	2.79	2.24	1.30	2.97	1.92	1.88	L	2.39	1.78	2.01	2.23	2.08	3.32	2.24	2.29	3.97	2.73	2.76	2.46	3.43	2.59	3.23
17. Masonry — brick, stone or conc. block	1.91	6.36	4.55	3.12	2.99	3.31	2.00	3.92	2.20	1.94	2.68	2.62	1.92	1.90	2.52	1.78	3.73	3.77	3.48	6.27	2.98	1.47	6.83	4.26	3.02	3.21
18. Office workers and draftsmen	.06	.09	.09	.08	.11	.08	.04	.09	.06	.06	.07	.07	.07	.07	.07	.07	.08	.07	.12	.06	.08	.08	.08	.07	.09	.06
19. Painting, decorating and paper hanging	2.10	4.54	5.56	5.03	3.98	2.93	2.00	4.00	2.33	2.56	3.84	2.68	3.51	2.69	3.11	2.18	3.66	3.16	3.61	K12.00	3.50	3.23	3.21	3.25	4.39	4.83
20. Painting — steel struct. and bridges	11.16	33.67	24.82	17.66	18.36	15.93	7.00	18.75	11.30	11.28	19.12	12.94	11.77	11.33	14.03	15.10	16.79	12.99	15.09	20.88	23.83	18.18	32.39	31.78	21.99	21.47
21. Plastering	1.86	4.06	4.16	5.15	3.36	2.57	1.30	3.34	2.65	2.06	2.76	2.43	2.06	2.38	2.68	2.52	3.52	2.69	2.75	3.66	2.63	3.23	2.46	4.08	3.13	3.90
22. Plumbing	1.22	2.73	3.06	2.09	2.05	1.87	.95	2.35	1.76	1.32	1.99	1.79	1.54	1.59	1.74	1.64	3.20	1.79	2.00	2.00	1.90	2.20	2.94	3.26	3.28	2.41
23. Roofing	5.15	12.98	10.81	10.41	9.27	8.56	4.00	8.89	6.19	6.91	9.51	8.26	7.86	7.07	7.57	6.35	8.99	7.64	7.50	11.25	13.52	10.04	8.42	9.67	10.81	11.02
24. Sheet metal erection	1.78	5.66	5.18	10.03	3.12	2.89	1.60	3.49	2.24	2.30	2.83	2.17	2.16	2.28	2.48	2.33	3.90	2.54	2.55	1.81	2.53	2.94	6.25	3.04	3.20	3.67
25. Steel erection — general	7.40	19.46	20.03	10.23	14.01	12.69	7.00	15.28	9.88	8.64	13.56	10.00	7.09	9.70	11.78	10.62	12.98	10.98	11.41	17.62	13.08	13.48	19.06	19.00	15.26	16.35
26. Steel erection — interior ornamental	2.15	4.43	6.12	4.07	3.87	3.21	7.00	4.03	2.70	2.58	L	3.42	2.47	2.77	3.08	2.91	4.63	3.08	3.21	3.86	3.81	3.81	7.35	4.91	3.72	4.40
27. Steel erection — structural	11.16	33.67	24.82	17.66	18.36	15.93	7.00	18.75	11.30	11.28	19.12	12.94	11.77	11.33	14.03	15.10	16.79	12.99	15.09	20.88	23.83	18.18	32.39	31.78	21.99	21.47
28. Supervising executives	.25	.88	.62	.44	.41	.37	G	.44	.29	.28	.37	.35	.27	.30	.33	.34	.46	.32	.38	.45	.40	.40	.93	.51	.43	.49
29. Tile or mosaic work — interior	1.00	1.79	2.79	1.61	1.77	1.49	.80	2.32	1.30	1.22	1.41	1.46	1.17	1.32	1.42	1.27	2.18	1.45	1.44	1.81	1.78	1.71	1.39	2.27	1.59	2.06
30. Watchmen and timekeepers (I)	1.53	6.36	4.23	G	2.71	3.29	G	2.91	1.94	1.83	3.26	2.29	1.74	1.98	2.16	2.02	3.20	2.19	2.24	3.05	2.63	2.69	5.41	3.41	3.69	3.15
31. Waterproofing	2.33	5.63	6.57	4.43	4.19	4.08	O	4.48	2.95	2.83	L	3.57	2.70	3.03	3.35	3.12	4.98	3.38	3.44	5.26	4.10	4.17	3.33	5.30	5.08	4.87
32. Wrecking	11.01	35.22	30.52	26.14	19.74	17.84	L	20.57	15.14	12.93	L	25.22	14.63	14.14	14.85	15.38	22.09	15.83	16.03	20.21	32.32	17.94	23.44	33.80	22.43	23.03

Classification of Work (A)	Nev.(F)	N. H.	N. J.	N. M.	N. Y.	N. C.	N.D.(F)	Ohio(F)	Okla.	Ore.(H)	Pa.	R. I.	S. C.	S. D.	Tenn.	Tex.	Utah	Vt.	Va.	Wash.(H)	W. Va.(F)	Wis.	Wyo.(F)
1. Boiler installation	State Insurance Plan Nevada Industrial Commission, Carson City, Nev.	4.04	7.80	3.50	7.52	4.09	North Dakota State Plan: Workmen's Compensation Bureau, Bismarck, N. D.	Ohio State Plan: Workmen's Compensation, The Industrial Commission of Ohio, Actuarial Section, Columbus, Ohio	10.29	9.20	4.70	6.52	7.02	3.67	4.20	5.80	7.88	2.63	2.91	7.07	West Virginia State Plan: State Compensation Commission Charleston, W. Va.	6.34	Wyoming State Plan: Manager, Workmen's Compensation Dept., State Treasurer's Office, Cheyenne, Wyo.
2. Carpentry, private residences only		2.48	5.70	2.79	7.30	2.33			6.26	6.36	2.90	4.60	4.65	2.85	2.72	4.04	4.50	1.88	2.15	4.59		5.81	
3. Carpentry, dwellings — 3 stories or less		2.48	5.70	2.79	7.30	2.33			6.26	6.36	2.90	4.60	4.65	2.85	2.72	4.04	4.50	1.88	2.15	4.59		5.81	
4. Carpentry, general		4.98	7.60	4.57	7.30	3.68			11.38	7.49	2.90	7.66	7.91	4.15	4.81	7.51	4.50	2.90	3.56	6.08		5.81	
5. Carpentry, interior trim		1.60	L	1.35	7.30	1.59			4.06	2.94	2.90	2.50	1.62	1.56	1.68	3.11	4.50	1.02	1.13	1.50		5.81	
6. Cement work, sidewalks, drives, etc.		1.75	4.40	1.67	4.73	1.57			4.30	3.19	3.95	2.66	2.35	1.72	1.86	2.71	3.50	1.10	1.34	2.30		2.53	
7. Concrete constr.— monolithic bridges (B)		7.49	11.10	7.96	11.16	8.44			18.52	11.58	7.00	11.65	12.48	6.48	8.59	8.21	15.41	4.40	6.40	L		12.46	
8. Concrete constr.— non-monolithic bridges (B)		3.99	11.10	3.96	8.83	5.22			12.50	6.69	7.00	6.95	8.71	4.09	3.86	7.51	10.83	2.83	3.57	5.15		12.46	
9. Concrete constr., general (B)		3.99	9.80	3.96	8.83	5.22			12.50	6.69	7.00	6.95	8.71	4.09	3.86	7.51	10.83	2.83	3.57	5.15		6.93	
10. Concrete constr.— dwgs. to 3 stories — (not mono.)(B)		3.44	9.80	2.14	8.83	2.35			4.12	5.83	7.00	5.66	3.92	1.67	2.16	7.51	4.12	2.31	1.89	4.48		3.40	
11. Electrical equipment installation		2.45	4.20	2.68	5.44	2.00			5.08	4.15	2.20	3.93	3.38	2.28	2.72	4.07	5.00	1.60	2.05	3.11		3.68	
12. Electric wiring — within buildings		1.47	2.40	1.48	3.25	1.64			3.89	3.29	1.55	2.31	2.14	1.39	1.61	2.47	3.00	.96	1.22	2.53		2.25	
13. Excavation — earth (C)		4.27	8.20	5.03	9.66	2.39			6.74	7.46	3.95	6.99	5.34	2.77	2.60	6.63	7.44	2.76	2.03	5.39		5.28	
14. Excavation — rock (D)		4.43	10.60	4.76	10.17	5.15			11.38	F	3.95	7.23	9.70	L	4.55	8.47	8.69	2.87	3.87	10.49		7.48	
15. Glazing		3.88	7.10	3.85	10.46	3.87			9.81	6.73	2.20	6.15	5.37	3.59	4.03	7.13	5.00	2.50	3.15	5.17		6.95	
16. Lathing		2.12	5.20	1.82	4.05	2.12			5.41	5.72	2.00	3.35	3.32	2.01	2.20	4.13	3.50	1.36	1.52	4.04		3.97	
17. Masonry — brick, stone or conc. block		3.44	8.10	2.14	7.81	2.35			4.12	5.83	3.35	5.66	3.92	1.67	2.16	7.51	4.50	2.31	1.89	4.48		3.40	
18. Office workers and draftsmen		.06	.09	.07	.10	.07			.07	.09	.06	.08	.09	.07	.07	.10	.10	.07	.05	.07		.10	
19. Painting, decorating and paper hanging		3.11	7.70	2.94	8.44	2.38			6.41	6.67	3.85	4.38	3.59	2.97	2.23	3.50	5.00	2.00	2.12	5.13		3.35	
20. Painting — steel struct. and bridges		13.64	24.70	15.23	L	13.94			35.59	25.39	11.00	22.67	19.63	11.54	13.19	14.08	20.00	8.87	10.96	19.52		16.42	
21. Plastering		2.56	5.20	2.22	5.37	2.23			5.78	5.72	2.00	4.08	3.32	2.35	2.43	4.67	4.50	1.63	1.87	4.04		2.65	
22. Plumbing		1.72	3.30	1.90	3.93	1.61			3.78	2.91	1.80	2.66	2.31	1.59	1.54	2.83	2.00	1.11	1.69	2.24		2.60	
23. Roofing		7.21	12.30	7.34	N21.50	6.19			18.37	15.59	6.15	11.99	9.15	6.50	6.07	10.90	11.00	4.68	6.28	H		12.48	
24. Sheet metal erection		2.38	4.60	2.25	6.48	2.58			5.95	6.42	3.10	3.84	3.59	2.20	2.60	3.36	4.00	1.54	1.92	4.59		3.38	
25. Steel erection — general		10.44	20.50	9.67	27.52	11.33			31.71	L	11.00	17.21	14.62	8.80	11.05	14.08	25.00	6.77	11.00	12.98		16.42	
26. Steel erection — interior ornamental		2.97	6.90	2.63	5.51	2.92			7.58	5.94	11.00	4.69	3.46	2.73	3.04	5.73	5.66	1.88	2.15	4.57		4.53	
27. Steel erection — structural		13.64	24.70	15.23	45.32	13.94			35.59	25.39	11.00	22.67	19.63	11.54	13.19	30.11	25.00	8.87	10.96	19.52		16.42	
28. Supervising executives		.32	.69	.30	.74	.33			.78	.75	G	.53	.68	.28	.31	G	.60	.21	.26	L		.56	
29. Tile or mosaic work — interior		1.36	2.15	1.16	3.06	1.34			3.45	2.10	2.18	2.12	1.53	1.35	1.44	2.00	3.50	.88	1.01	1.62		2.12	
30. Watchmen and timekeepers (I)		2.04	L	2.67	7.78	2.07			5.19	5.45	G	3.26	2.85	1.93	2.16	G	3.84	1.33	2.24	4.69		3.59	
31. Waterproofing		3.21	6.70	3.40	O	3.18			8.14	4.70	O	5.06	3.80	3.00	3.33	6.18	5.98	2.04	2.78	L		5.93	
32. Wrecking		14.88	30.90	15.42	M	14.99			34.67	32.43	L	23.96	32.77	13.59	16.69	27.12	43.09	9.55	12.80	24.03		31.00	

Note: Base rates subject to increase or decrease according to experience ratings.

(A) Special rates apply for carpentry, concrete and steel work on military reservations. (B) Includes construction of forms. (C) Includes blasting, but not pile driving, caisson or cofferdam work. (D) Includes blasting, but not pile driving, caisson or cofferdam work; special rates for occupational disease. (E) Employers Liability rates — no compensation law in this state. (F) Compensation must be carried with Monopolistic State Fund. (G) Assign to governing classification. (H) Occupations specified as hazardous must be insured in State Fund. (I) Not applicable if general contractor is conducting operations at job. (J) Not applicable to executive supervising a single job or location. (K) Outdoor painting only — indoor painting and paper hanging 1.36. (L) Rate available on application to company only. (M) Rated on cubic content. (N) Flat roof work 14.04 in New York; 5.13 in Arizona. (O) Waterproofing in Delaware, New York and Pennsylvania rated according to type.

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Chapter I

Foremanship — the foreman's responsibility to his job, to the superintendent, to his men, to his fellow foremen, to subcontractors and the general public; qualities which make for successful foremen . . 7

Chapter II

The Foreman's Place in Accident Prevention — planning for accident prevention; accident investigation; developing the accident prevention program 15

Chapter III

The Foreman and His Men — selection and hiring, placing and training, supervisory methods 23

Chapter IV

Job Planning — in relation to long range planning, layout of the job, receipt of materials, day-to-day plan 33

Chapter V

Physical Protection — excavation, staging and scaffolding, runways and platforms, barricades, overhead protection, clothing 41

Chapter VI

Care, Use and Storage of Equipment — principles of selection, testing and inspection; rigging, hand tools, supports, derricks, scaffolds, safe practice rules, machine operators, trucks, cranes, moving equipment, moving material, air equipment, machine guards, yard storage, tool storage 51

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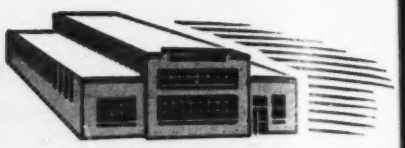

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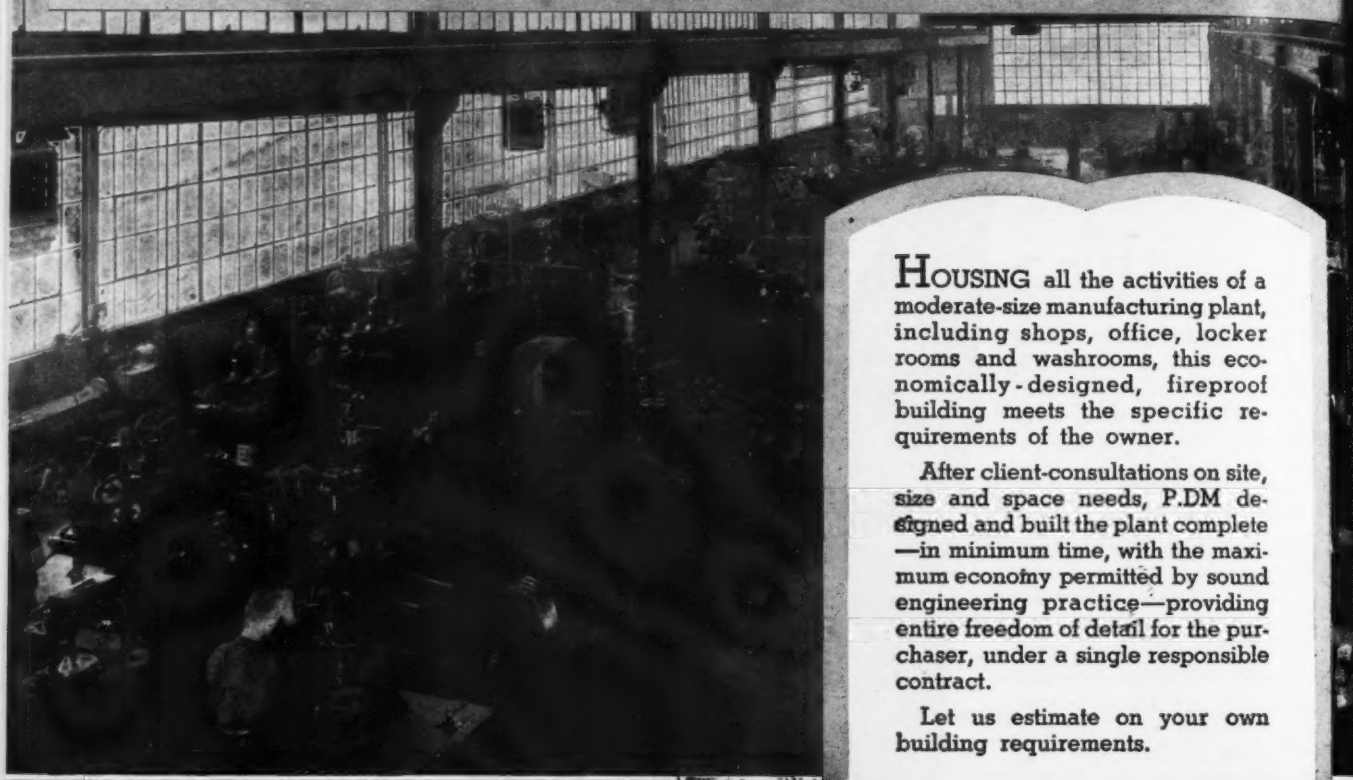

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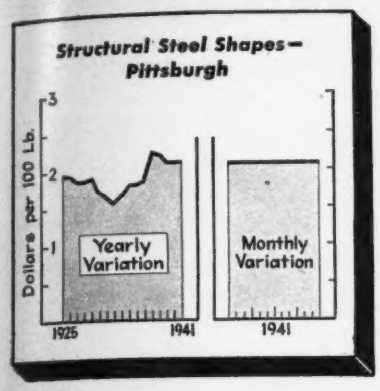
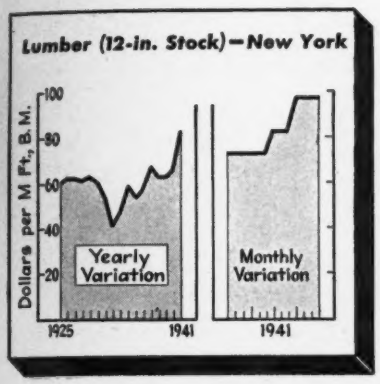
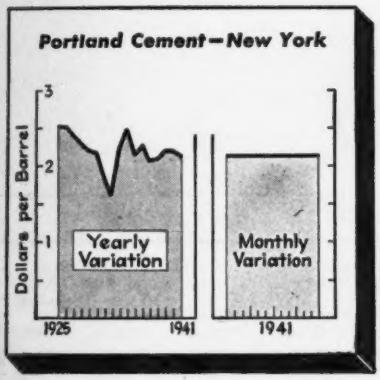
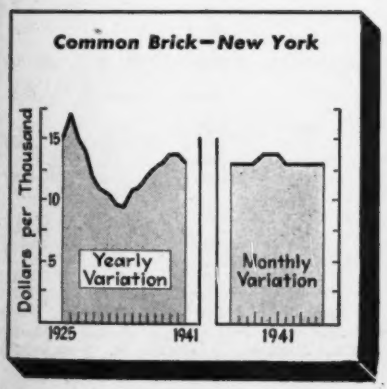








Prices of Construction Materials

CONSTRUCTION MATERIAL prices in New York, excepting lumber, remained steady during 1941. Long leaf yellow pine opened the year at $72.50 per M ft., stayed at that level through May, then climbed to $82.50, a price which held through August. In September, the price jumped to $97.50 and remained there for the balance of the year.

Common brick began the year at $13.00 per M, and with the exception of a price of $13.50 in May, June and July, remained at that level. Portland cement, structural steel and cast iron pipe were unchanged.

Basic Building Materials Prices

1874 to 1941 in New York City

Average yearly prices at New York, except in the case of steel, which is f. o. b. Pittsburgh mill; wrought iron I beams for years 1879, 1885 and 1886. Brick, wholesale, f. o. b. Lime, common lump, wholesale, f. o. b., 180 lb., net, 1910–15, incl.; afterward, 280 lb. Cement, net, delivered; *Rosendale, 1874 to 1878, incl.*; afterward, Portland. Lumber, No. 1 com., rough, wholesale, at dock, for 1 in., yel. pine, 1874 to 1909, incl.; afterward, 3 in., long-leaf to 1913, incl. *LLYP–3 x 12 — from Lumber Trade Journal. †LLYP–12 x 12 as reported to Engineering News-Record. Cast iron pipe price per ton f. o. b. Delaware River foundries; *prices prior to 1901 are for all classes of bell and spigot*; prices subsequent to 1901 are for 6-in. and larger Cl. B or heavier bell and spigot; early prices from "Price History of Cast Iron Pipe" by United States Cast Iron Pipe and Foundry Co.; prices 1850, $35.72; 1855, $40.18; 1860, $32.15; 1865, $58.05; 1870, $50.

	Brick Common per M	Cement Per Bbl.	Lime Per Bbl.	Pine per M. Ft. b.m.		Steel Shapes, Per 100 Lb.	Cast Iron Pipe, Per Ton
1874	$7.41	*$1.48*	$1.50	$26.00		....	*$43.76*
1875	7.12	*1.25*	1.40	21.00		....	*37.51*
1876	5.87	*1.20*	1.00	21.00		....	*31.26*
1877	4.93	*1.10*	.80	20.00		....	*25.00*
1878	4.71	*.95*	.70	20.00		....	*23.22*
1879	4.08	2.70	.80	20.96		$2.78	*29.47*
1880	7.00	2.88	.87	19.00		....	*29.47*
1881	7.50	2.72	.95	19.00		....	*33.04*
1882	7.12	2.82	1.01	19.00		....	*35.68*
1883	8.28	2.75	1.05	19.00		....	*32.15*
1884	6.65	2.60	.95	19.00		....	*26.79*
1885	6.10	2.28	1.00	18.66		3.12	*25.00*
1886	7.51	2.28	1.00	19.00		3.00	*26.79*
1887	7.43	2.07	.82	19.00		....	*28.58*
1888	6.50	2.16	.83	16.75		....	*25.00*
1889	7.06	2.23	.92	20.31		....	*29.04*
1890	6.65	2.25	.95	21.75		....	*24.65*
1891	5.53	2.38	.87	18.00		....	*23.04*
1892	5.77	2.27	.93	18.50		....	*21.43*
1893	5.83	2.15	.93	18.50		....	*21.50*
1894	5.00	2.03	.85	18.50		1.20	*18.47*
1895	5.31	1.97	.78	16.92		1.35	*17.95*
1896	5.06	2.00	.69	16.42		1.60	*17.64*
1897	4.94	1.97	.72	16.44		1.24	*15.48*
1898	5.75	2.00	.70	15.75		1.27½	*15.48*
1899	5.69	2.05	.75	16.25		1.45	*21.17*
1900	5.25	2.16	.68	24.50		1.95	*22.33*
1901	5.77	1.89	.77	17.50		1.60	*21.63*
1902	5.39	1.95	.81	21.00		1.60	26.62
1903	5.91	2.03	.79	23.50		1.70	27.56
1904	7.50	1.67½	.80	21.50		1.60	22.92
1905	8.10	1.43	.89	24.92		1.62	26.54
1906	8.55	1.55	.95	29.33		1.60	30.12
1907	6.16	1.55	.95	30.50		1.75	31.52
1908	5.10	1.46	1.05	30.50		1.76	24.69
1909	6.39	1.41	1.05	33.04		1.50	24.19
1910	5.76	1.07	.75	24.00		1.46	22.99
1911	5.31	1.04	.75	24.63		1.36	19.99
1912	6.75	.97	.75	24.92		1.33	21.22
1913	6.75	1.18	.91½	* 25.04	†	1.50	21.96
1914	5.50	1.17½	.97	21.79	29.25	1.16	20.37
1915	5.50	1.00	.97	21.68	27.91	1.28	22.52
1916	8.00	1.32	1.50	27.60	31.58	2.45	30.25
1917	9.10	1.76	2.02	38.00	37.81	3.62	52.33
1918	10.98	2.48	2.16	46.68	43.33	3.00	58.68
1919	15.79	2.63	2.65	57.04	49.60	2.52	53.87
1920	18.00	3.52	3.15	71.17	66.50	2.45	71.77
1921	17.40	2.82	3.47	50.67	51.54	2.00	50.58
1922	16.91	2.43	2.79	49.41	51.83	1.70	46.42
1933	20.00	2.66	2.98	61.77	62.25	2.39	57.75
1924	18.00	2.50	2.88	55.17	59.00	2.19	54.33
1925	15.00	2.50	2.38	57.00	59.67	1.95	49.16
1926	17.00	2.50	2.18	60.33	62.17	1.93	48.50
1927	15.00	2.40	2.49	62.57	61.46	1.86	41.42
1928	14.00	2.30	2.30	63.33	61.34	1.87	35.92
1929	11.71	2.23	2.25	64.50	63.00	1.92	36.66
1930	10.88	2.19	2.25	64.33	60.64	1.71	37.00
1931	10.29	1.89	2.25	58.17	53.02	1.63	34.71
1932	9.75	1.62	2.25	39.91	41.33	1.56	30.58
1933	9.50	2.26	2.50	46.25	46.79	1.64	34.58
1934	10.87	2.48	2.50	57.17	58.92	1.78	41.00
1935	11.00	2.15	2.35	51.67	53.75	1.80	42.58
1936	12.00	2.26	2.80	56.75	57.75	1.84	43.00
1937	12.50	2.07	2.80	61.50	66.46	2.21	48.75
1938	13.10	2.12	2.80	59.33	62.75	2.18	48.33
1939	13.46	2.20	2.80	64.35	62.50	2.10	46.75
1940	13.50	2.20	2.68	67.39	65.46	2.10	49.00
1941	13.13	2.15	2.66	75.50	83.33	2.10	49.00

INDEX NUMBERS OF WHOLESALE PRICES — BUREAU OF LABOR STATISTICS

(1926 = 100)	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932
Building materials	103.2	94.8	90.5	90.3	95.2	86.7	85.3	86.2	77.0	71.4
Brick and tile	93.7	90.5	91.4	91.0	93.5	88.7	89.4	90.2	79.2	77.3
Cement	92.0	90.8	91.3	90.3	89.0	92.2	92.7	93.1	88.1	74.3
Lumber	122.5	102.9	93.2	87.4	99.7	87.0	81.1	84.5	70.7	58.5
Paint and paint materials	91.4	85.7	82.8	81.3	83.4	80.1	79.8	79.5	73.3	71.1
Plumbing and heating	84.8	83.4	79.2	78.5	78.8	75.0	68.9	72.6	67.1	66.8
Structural steel	107.3	107.3	107.3	111.0	113.2	95.0	92.0	90.8	83.1	80.9
Other building materials	98.3	93.3	90.3	92.7	99.1	90.2	90.1	90.3	82.7	79.5

Materials and Labor Prices, December, 1941

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

CEMENT AND LUMBER price changes share the spotlight in the December construction material list. Portland cement in cloth bags is up 15c. per barrel in Detroit, 10c. in Baltimore, and 5c. in Dallas. The San Francisco cloth bag price has been withdrawn, but the price in paper is 25c. per barrel higher than a month ago.

Short leaf Southern pine is $2.00 to $4.00 lower in Atlanta, and off $1.00 on 1-in. sizes in New York, but up $1.00 on 1x8-in. in Chicago. St. Louis prices are mixed. Spruce is $2.00 higher on 1-in. sizes in Boston. Douglas fir is down $2.00 in New York.

Structural steel shapes remain at last month's levels. Reinforcing steel is 9c. per 100 lb. higher in Detroit. Ready-mixed concrete is up 25c. per cu. yd. in Baltimore, Minneapolis and St. Louis. Structural clay tile is up in Baltimore and Detroit, but off $2.00 per M in St. Louis. Brick prices increase in Atlanta, Detroit and Kansas City.

Skilled labor rates are unchanged from a month ago. The common labor rate on heavy construction in Kansas City is now 54c. per hour, an increase of 4c. from November.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT (Per bbl., carload lots, including 40c per bbl. for bags, cash discount not deducted)			SAND AND GRAVEL (Per ton, carload lots)			CRUSHED STONE (Per ton, carload lots)		CRUSHED SLAG (Per ton, carload lots, f.o.b. plant)		CONCRETE Ready Mixed 1:2:4, 50 c.y. or more, delivered
	Cloth Bags *a*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.73	$2.48	$2.43	$1.75	$1.85	$1.95	$1.75	$1.85	$1.55	$1.65	$7.90
Baltimore	2.46	2.21	2.01	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	7.25
Birmingham	2.50	2.25	2.05	1.75	1.75	1.40/1.50	1.00	1.00	.90	1.15	5.80
Boston	2.75*b*	2.50*b*	2.30	1.40‡	1.40‡	1.00‡	1.40‡	1.40‡	....	....	7.25*m*
Chicago	2.60	2.35	2.20	2.00‡*d*	2.00‡*d*	2.00‡*d*	2.00‡*d*	2.00‡*d*	1.50‡	1.50‡	....
Cincinnati	2.31	2.06	1.81	1.20	1.20	1.10	1.80	1.80	....	....	6.60
Cleveland	2.29	2.04	....	1.50*i*	1.50*i*	1.30*i*	1.90*i*	1.90*i*	1.70*i*	1.70*i*	7.30*i*
Dallas	2.52	2.27	2.07	1.75*p*	2.00*p*	1.25*p*	1.69*p*	1.84*p*	....	....	6.20
Denver	3.08	2.83	....	1.20	1.40	.90	....	....	....	....	7.25
Detroit	2.39	2.14	1.94	1.31	1.41	.91	1.50	1.50	1.65‡	1.65‡	6.50
Kansas City	2.56	2.31	2.16	1.85	2.30	1.00	1.91	1.91	....	....	7.25*n*
Los Angeles	2.25*b*	2.05*b*	....	1.20	1.20	1.15	1.20*f*	1.20*f*	....	....	6.35
Minneapolis	2.90	2.65	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	7.60*f*
Montreal	....	1.95*rs*	1.70*rs*	....	....	1.25‡‡	.85‡‡*t*	1.00‡‡*t*	....	....	6.45*ls*
New Orleans	2.41	2.16	1.96	1.50	1.50	1.25	....	....	....	....	7.25
New York	2.55‡	2.30‡	....	1.50*de*	1.50*de*	.90*de*	1.65*de*	1.75*de*	....	....	6.75
Philadelphia	2.32	2.07	1.87	1.55‡	1.65‡	1.35‡	....	....	1.10	1.10	8.20*k*
Pittsburgh	2.44	2.19	1.99	1.40‡	1.40‡	1.70‡	2.25‡	2.25‡	1.50	1.50	8.25
St. Louis	2.80	2.52	....	1.50‡	1.50‡	1.25/1.50‡	1.10*h*	1.10*h*	.75*g*	.75*g*	8.00
San Francisco	*u*	2.21	1.76	1.36	1.36	1.36	1.46	1.46	....	....	6.95
Seattle	2.95*o*	2.70*o*	....	1.00*o*	1.00*o*	1.00*o*	2.00*o*	2.00*o*	....	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount 35c. 500 to 2000; 70c. 2000 to 5000; 95c. over 5000. *l* Up to 200cu. yd. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u* Price withdrawn.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

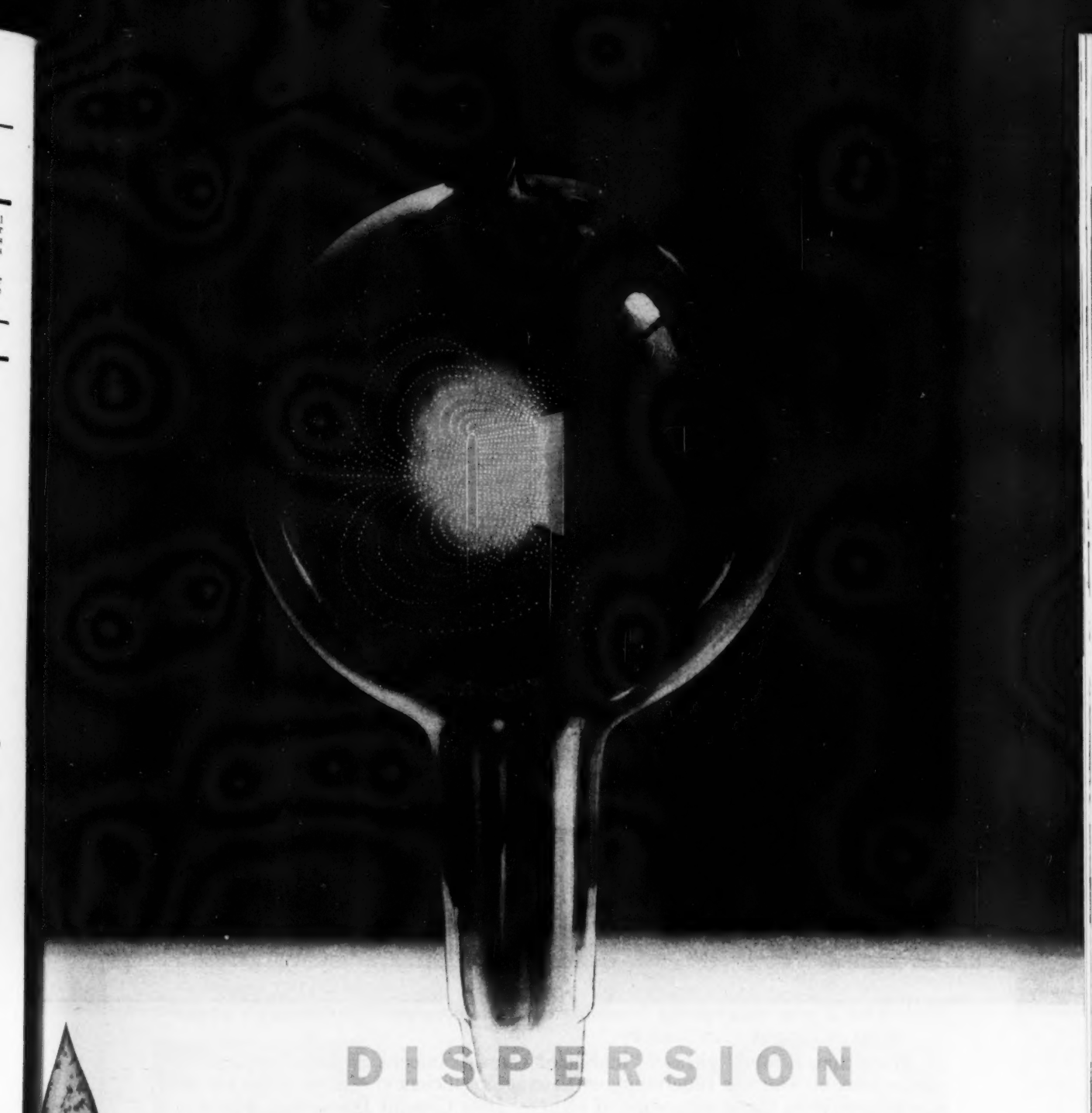
Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind.	$1.70	$1.65	Ironton, Ohio	$1.60	$1.55	Richard City, Tenn.	$1.80	$1.75
Dallas, Tex. (Inc. 10c. tax)	1.85	1.80	Limedale, Ind.	1.70	1.65	Steelton, Minn.	1.80	1.75
Hannibal, Mo.	1.70	1.65	Norfolk, Va.	1.75	1.70	Universal, Pa.	1.65	1.60
Hudson, N. Y.	1.75	1.70	Northampton, Pa.	1.55	1.50	Waco, Tex. (Plus 10c. tax in Tex.)	1.75	1.70
Independence, Kans.	1.70	1.65	North Birmingham, Ala.	1.70	1.65	Montreal (8% sales tax incl.)	1.68	1.67

PAVING BRICK, BLOCKS, ASPHALT, ROAD OILS—F.O.B. CITY

	PAVING BRICKS AND BLOCKS: Granite per M. lots of 50,000 4x4x8 in.	Brick per M. 3-4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	PAVING ASPHALT: Per ton, less than 80 penetration, Tank car	Drums	ASPHALT BINDERS—FLUXES: Per gal., 80-300 penetration, Tank car	Drums	CUTBACK ASPHALT: Per ton, Tank car	Drums	ROAD OILS: Per gal., Tank car	ASPHALT EMULSION (Quick-breaking) Per gal., Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$17.30*c*	$23.83*c*	$0.0695*c*	$0.1018*c*	$0.0734*hc*	$0.1257*h*	$0.0634*c*	$0.0734	$0.1257
Baltimore	165.00‡	45.00‡	2.90	14.00	20.00	.06	.09	.065*h*	.115*h*	.....	.....	.....
Birmingham	.....	24.50*j*‡	....	18.20	23.20	.0747	.1047	.0834*h*	.1484*h*	.....	.....	.....
Boston	90.00	50.00	3.50	14.00	20.00	.06	.09	.065*h*	.115*h*	.065	.09‡	.12‡
Chicago	150.00	47.50	1.85*d*	14.50	18.50	13.00*g*	17.00*g*	.065*h*	.11*h*	.055	.10	.135
Cincinnati	112.00	37.50	....	16.00	20.00	.08	.....	16.80	.....	.07	.....	.085
Cleveland	110.00	39.00	2.25	20.00	25.50	.095	.115	.105*h*	11.00	.0675	.09	.10‡
Dallas	.....	36.00	....	13.25	20.30	.06	.103	16.00	24.80	.055	05/.07	.07/.09
Denver	.....	27.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	35.00	.....	14.10*f*	19.00*f*	.061	.1025	14.10	18.60	.0425	.0645	.098
Kansas City	.....	40.00	.....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	....	6.50*b*	15.00	6.50*bg*	15.00*bg*	5.50*b*	.....	.0172	.0525	.1125
Minneapolis	.....	.....	1.90*d*	21.20*m*	27.70	.10*m*	.126	19.00*m*	32.64	.06*m*	.....	.....
Montreal	75.00*k*	.....	3.62*k*	16.60*k*	24.25*k*	.116*k*	.1485*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	....	14.00*a*	19.00*a*	.055	.085	.06*h*	.09*h*	.....	.078	.....
New York	.....	.....	....	15.00	21.00	.06	.09	.065*h*	.115*h*	.....	.0725	.....
Philadelphia	120.00	42.50	....	15.00	22.00	.06	.12	.07*h*	.13*h*	.06	.07	.13
Pittsburgh	135.00	38.75	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis	115.00/125.00	37.00	....	14.00	18.00	12.00*g*	16.00*g*	.055*h*	.095*h*	.04	.09	.125
San Francisco	.....	70.00	....	9.50	18.00	9.50*g*	18.00*g*	10.00	17.50	9.50*g*	.0525	.1125
Seattle	.....	60.00*c*	....	16.70	26.10	.....	26.10*g*	12.50/13.50	26.00/27.00	10.75*g*	.0575*i*	.1308*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 6 to 8-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3½x8½ in. *k* tax included. *m* August prices; tank car price withdrawn in September.



DISPERSION

Radio, based upon the *dispersion* of electrons, shares the principle responsible for important characteristics in steel, rubber, plastics, ceramics, paints and many other products essential to modern living.

High in the list of outstanding applications of the *dispersion* principle, is Cement Dispersion, one of the major technologic advances of recent years, and a factor of paramount importance to all concrete construction.

IN STEP WITH PROGRESS . . . . .

CEMENT DISPERSION

WHY NOT "Mobilize" CEMENT FOR ALL OUT WAR EFFORT ?

CEMENT is actually being "mobilized" in the construction industry's all-out effort to speed vital victory.

More than a fancy phrase, "mobilized cement" means *dispersed* cement. It means cement which is functioning with greater efficiency — more particles are in active service. (See explanation at right—"How Cement Dispersion Works".)

Dotting the map from coast-to-coast are aeroplane plants, ordnance plants, chemical plants, plants for making all types of mechanized equipment, ship-building basins, dams, bridges, etc., whose completion has been greatly speeded with important dollar-savings, by the use of Cement Dispersion.

Whenever a project calls for concrete, it pays to investigate Cement Dispersion whether the requirements are speed, strength, workability, placeability, water-tightness or durability.

You will find valuable reading in Paper No. 36 "Economics of Cement Dispersion"— send for a copy and complete information on Pozzolith.

THE MASTER BUILDERS COMPANY

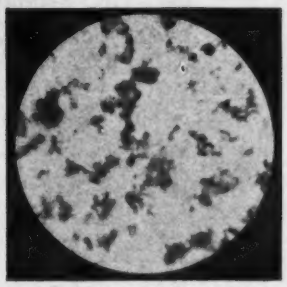
CLEVELAND, OHIO — TORONTO, CANADA

MASTER

CEMENT DISPERSION WILL DO IT!

SPEEDING AIR SUPREMACY

Pozzolith was used in the walls and floors of this mammoth blackout plant, now producing giant bombers and flying fortresses, to save precious days in construction.



Cement suspended in water
UNDISPERSED

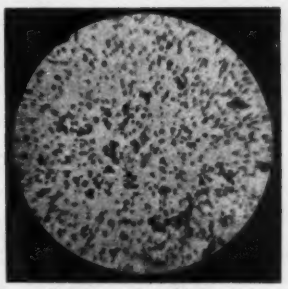
WITHOUT POZZOLITH

In a normal concrete mix, cement particles tend to bunch together, thereby (1) limiting hydration and (2) trapping water within the cement clumps. (See photomicrograph above).

HOW CEMENT DISPERSION WORKS

Only a part of the cementitious value of the cement, whether normal portland or high early, is utilized under usual construction conditions. Investigation shows that with 28 days curing only 50% hydrates. [Anderegg and Hubbell, A. S. T. M. 29 II 554 (1929)].

Dispersed cement produces 25% to 40% higher compressive strengths.



Cement suspended in water
DISPERSED

WITH POZZOLITH

Cement Dispersion drives these particles apart and (1) exposes their entire surface area to hydration, at the same time (2) making the water entrapped in the clumps available for lubrication of the mix. (See photomicrograph above).

BUILDERS

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton: Standard	Light	Re-rolled	TRACK SUPPLIES: Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	$4.75
Chicago	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Pittsburgh	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Buffalo	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	...
Cleveland	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	...
Youngstown	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	.....
Detroit	.....	2.25‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gulf ports	2.45*a*	2.50*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	.....
Pacific ports	2.75*a*	2.80*a*	.....	.....	2.95*a*	.....	.....	.....	.....	.....	2.30	.....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates, alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per c.l.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

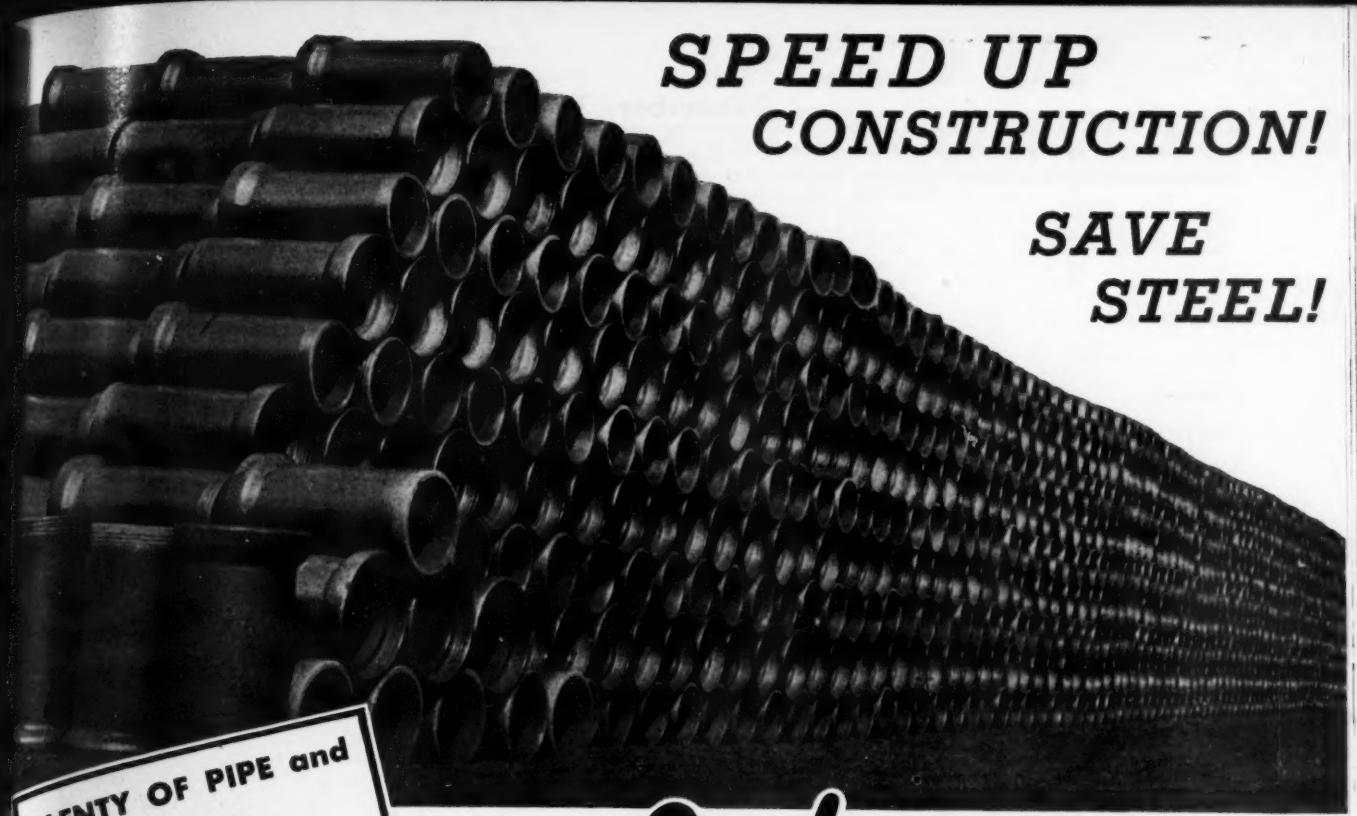
	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ¼ in., base price: 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH—Per 100 sq.yd., carload lots: Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING—Per 100 s.f., carload lots: 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6 & 6 wires 6x6 in. No. Per sq. yd.	SHEET PILING Per 100 lb. base price
Atlanta	$2.34	$2.39	$2.39	.02½	.10	$21.06	$23.00	$1.82	$1.35	$0.1719	$3.04
Baltimore	3.70	2.90	2.75	.....	.10	31.00	32.00	1.70	1.27	.1611	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.50	1.80	1.34	.1701	....
Boston	3.75	3.11	3.01	$20 C.L.	.10	17.00	19.00	1.76	1.31	.1656	2.77
Chicago	2.10*a*	2.15	2.15	.03	.05	21.00	23.00	1.67	1.25	.1575	2.40
Cincinnati	3.08	2.51*cd*	2.51*cd*	.....	.05	19.50	21.50	1.66	1.25	.1566	....
Cleveland	3.58*g*	2.15	2.15	.02½	.10	19.50	21.50	1.66	1.25	.1566	....
Dallas	6.00	3.40	3.40	.....	.....	24.50	26.50	1.93	1.42	.1827	....
Denver	4.35	3.95	3.80	.....	.....	26.50	28.50	1.97	1.45	.1863	....
Detroit	3.65‡	2.34	2.24	.....	.10	22.00	24.00	1.68	1.26	.1584	2.66
Kansas City	4.17	2.61*cd*	2.61*cd*	.0	.05	19.50	23.50	1.78	1.33	.1683	2.86
Los Angeles	3.65*f*	2.25	2.10	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis	3.80‡	2.48*c*	2.48*c*	.0	.10	25.00	27.00	1.80	1.34	.1701	2.73*d*
Montreal	3.90*i*	2.65*i*	2.55*i*	.....	.....	26.00*hi*	33.00*hi*	2.58*i*	3.22*i*	.264*i*	....
New Orleans	4.40	2.52	2.52	.05	.10	21.50	23.50	1.82	1.35	.1719	2.875
New York	3.75	2.76*c*	2.76*c*	.....	.15	17.50	19.50	1.76	1.32	.1665	2.74
Philadelphia	3.55	2.47	2.47	.....	.....	.....	.....	1.71	1.28	.1611	2.72
Pittsburgh	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis	3.69	2.39	2.39	.0	.05	28.00	34.00	1.69	1.27	.1602	2.70
San Francisco	4.70	2.65	2.50	.02½	.10	21.00	24.50	1.93	1.42	.1827	3.00
Seattle	2.75*e*	2.50*e*	.....	.....	.....	34.50	38.50	1.93	1.42	.1827	2.95*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. L. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE: Per foot, std. 8 in., e.s.	delivered std. 12 in., e.s.	ASTM 24 in.,	C13–35 36 in.,	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h*: 1 to 3 in., Butt Weld Black %	Galv. %	3½ to 6in.; Lap Weld Black %	Galv. %
Atlanta	$49.40	$0.26*b*	$0.468*bc*	$1.8525	$4.68*c*	$85.00	$128.00	$0.45	$1.642	48.4	54.2	59.7	51.2
Baltimore	52.80	.45	.70	2.50	6.90	120.00	160.00	.75	2.00	65.5	57.5	63.0	54.5
Birmingham	45.00	.275	.495	1.95	4.66	100.00	220.00	.40	1.60	62.2	54.2	59.7	51.2
Boston	55.00	.40	.75	....	....	210.00‡	325.00‡	.65	2.30	64.1	56.1	61.6	53.1
Chicago	53.80	.28	.54	2.25	6.25	100.00‡	150.00‡	.38	1.48	67.0	59.0	63.5	55.0
Cincinnati	52.70	.231	.4455	1.80	5.125	105.00	170.00	.60	1.70	65.9	57.9	63.4	54.9
Cleve'and	54.24	.224	.432	1.80	5.125	81.60	125.00	.35	1.50	67.8	59.8	65.3	56.8
Dallas	58.20	.305	.549	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3
Denver	60.60	.24†	.52†	2.16†	.....	130.00	240.00	....	....	58.4	50.4	55.7	47.2
Detroit	54.24	.245	.4725	1.935	4.60	78.60	125.00	.35	1.50	66.3	58.3	63.8	55.3
Kansas City	55.12	.315	.59	2.20	5.86	140.00	260.00	.45	1.60	62.9	54.9	60.0	51.5
Los Angeles	55.00	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	59.6	51.6	57.0	49.6
Minneapolis	59.00	.275†	.495†	1.98†	5.14†	.....	.....	.70	1.80	64.2	56.2	60.7	52.2
Montreal	60.00	.55	.90	3.68	5.95*e*	135.00‡	260.00‡	.48*l*	1.92*l*	.....	.....	.....	....
New Orleans	51.38	.26	.48	1.69	.....	150.00	220.00	.37	2.10	62.4	54.4	58.8	50.3
New York	52.20	.455	.8775	2.925	7.65	.....	.....	.50	1.20	64.9	56.8	62.4	53.9*i*
Philadelphia	.....	.....	.....	.....	.....	.....	.....	...	....	65.3	57.3	62.8	54.3
Pittsburgh	55.60	.245†	.4725†	1.845†	5.4325	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5
St. Louis	52.48	.28	.504	2.016	4.50	85.00	220.00	.90*j*	1.60*k*	56.4	47.6	52.5	38.1
San Francisco	58.00	.3625*d*	.6525*d*	2.61	6.52	115.50	192.50	.54	2.75	45.0	31.0	47.0	34.5
Seattle	55.35	.375	.675	2.70	6.75	84.00	187.50	.45*f*	1.40*f*	.....	.....	.....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N.J. (base) $49.00. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¼ in., 8½c.; ⅜ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½ in.; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76-37. *k* Reinforced; spec. C 75-37. *l* Plus sales tax.



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Vitrified Clay
SEWER PIPE
Saves Steel Essential for Defense

●

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(Cradle Invert Type)
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LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face)									LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD• Rail freight increment (See note for base price)	
	All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)												
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	¼"	¾"
Atlanta	**$25.00**	**$25.00**	**$24.00**	**$24.00**	**$26.00**	**$27.00**	**$43.00**	.....	.....	$60.00	$65.00	$17.75	$21.60
Baltimore	**39.00**	**40.00**	**40.00**	**38.00**	**38.00**	**40.00**	**56.00**	.....	.....	89.00	94.00	17.35*g*	21.15*g*
	44.00	*44.50*	*45.00*	*45.00*	*45.00*	*47.00*	*56.00*	*$59.00*	*$59.00*	.....	.....	.....	.....
Birmingham	**34.50**	**34.50**	**32.00**	**32.00**	**32.00**	**34.00**	**53.00**	**51.00**	**53.00**	.....	.....	16.25	19.85
[1]	37.50	37.50	37.00	37.00	37.00	43.00	65.00	.....	.....	67.50	70.00	.....	.....
Boston	40.00[2]	40.00[2]	45.00[2]	45.00	70.00[1]	75.00[1]	85.00[1]	.....	.....	85.00	90.00	17.35*g*	21.15*g*
	40.00	*40.00*	*50.00*	*50.00*	*50.00*	*50.00*	*70.00*	*75.00*	*75.00*	.....	.....	.....	.....
Chicago	**45.00**	**43.00**	**42.00**	**42.00**	**44.00**	**45.00**	**53.00**	.....	.....	90.00	100.00	13.80	16.80
	45.00	*44.00*	*44.00*	*44.00*	*46.00*	*47.00*	*50.00*	*50.00*	*50.00*	.....	.....	.....	.....
Cincinnati	**40.00**	**41.50**	**38.00**	**39.50**	**40.00**	**41.00**	**52.50**	.....	.....	60.00	63.00	16.25	19.85
	.....	.....	.....	.....	.....	.....	*54.50*	*54.50*	*54.50*	.....	.....	.....	.....
Cleveland	**42.00**	**42.00**	**42.00**	**42.00**	**44.00**	**47.00**	**55.00**	55.00	55.00	90.00	90.00	16.70	20.40
Dallas *e*	**39.00**	**40.00**	**39.00**	**37.50**	**38.00**	**39.50**	**53.00**	**53.00**	**53.00**	78.00	83.00	13.90	16.95
Denver ‡	54.00[4]	52.00[4]	55.00[4]	54.00[4]	54.00[4]	56.00[4]	59.00[4]	69.00[4]	75.00[4]	.....	.....	9.90	12.05
Detroit	**46.00**	**46.00**	**46.00**	**46.00**	**46.00**	**48.00**	**53.00**	.....	.....	53.00	61.50	16.25	19.85
	.....	.....	.....	.....	.....	*51.50*	*54.00*	*60.00*	*60.00*	.....	.....	.....	.....
Kansas City	**42.50**	**45.00**	**42.50**	**42.50**	**45.00**	**47.50**	**55.00**	.....	.....	70.00	75.00	12.25	14.95
	50.00	*50.00*	*50.00*	*50.00*	*50.00*	*50.00*	*60.00*	*70.00*	*70.00*	.....	.....	.....	.....
Los Angeles *a*	*52.00*	*52.00*	*50.00*	*50.00*	*52.00*	*52.00*	*56.00*	*65.00*	*66.00*	.....	.....	9.35*gh*	11.35*gh*
Minneapolis ‡*b*	48.00[3]	48.00[3]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.05	14.70
‡	*50.00*	*50.00*	*52.00*	*51.00*	*51.00*	*52.00*	*58.00*	*60.00*	*60.00*	.....	.....	.....	.....
Montreal †[7]	*36.00*	*38.00*	*36.00*	*38.00*	*40.00*	46.00	.....	.....	.....	155.00	165.00	.....	.....
	42.25	*42.25*	*42.00*	*44.00*	*44.00*	*46.75*	*60.25*	*60.25*	*60.25*	.....	.....	.....	.....
New Orleans	**31.50**	**31.50**	**33.75**	**31.75**	**32.00**	**34.25**	**48.00**	.....	.....	58.50	60.00	13.90	16.95
	31.00	*31.00*	*33.00*	*31.00*	*31.00*	*32.00*	*33.00*	.....	.....	.....	.....	.....	.....
New York ‡	**45.00**	**46.00**	**45.00**	**46.00**	**47.00**	**49.00**	**57.00**	.....	.....	100.00*f*	110.00*f*	17.35*g*	21.15*g*
‡	.....	.....	*60.00*	*60.00*	*60.00*	*60.00*	*65.00*	*65.00*	*65.00*	.....	.....	.....	.....
Philadelphia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17.35*g*	21.15*g*
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh	**50.80**	**53.20**	**62.75**	**55.00**	**60.85**	**62.50**	**76.25**	.....	.....	.....	.....	17.00	20.70
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*88.75*	*88.75*	*88.75*	.....	.....	.....	.....
St. Louis ‡*c*	**42.00**	**42.50**	**42.00**	**40.00**	**41.00**	**43.00**	**56.00**	*66.00*	*66.00*	78.00	65.00	13.90	16.95
San Francisco *d*	*33.50*	*33.50*	*36.25*	*34.50*	*34.50*	*34.50*	*40.00*	*39.50*	*39.50*	.....	.....	7.30*g*	8.90*g*
Seattle	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*40.00*	*40.00*	*40.00*	.....	.....	0.00	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [6] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* F.o.b. cars San Francisco freight rate. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax.

NOTE: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on ¾", $86.50; on ¾", $95.30; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. •Many mills out of market due to rush of defense orders. *g* Lower rate by water shipment. *h* 50,000 lb. minimum

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots•
Atlanta	75%	75%	$0.15
Baltimore	79%	80%	.15
Birmingham	75%	75%	.105
Boston	78%	79%	.15
Chicago	79%	79%	.15
Cincinnati	77%	77%	.15
Cleveland	77.2%	77.2%	.19
Dallas	78%	78%	.1625
Denver	77%	77%	.155*e*
Detroit	79-10%	79-10%	.15
Kansas City	76-10%	76-10%	.155
Los Angeles	86%*d*	88%*d*	.1575
Minneapolis	76%	76%	.155
Montreal	40-10%‡	50-5%‡	.155†
New Orleans	70%	75%	.16
New York	81%	82%	.22*f*
Philadelphia	.....	.....	.15
Pittsburgh	79%	79%	.1225
St. Louis	77-10%	77-10%	.155
San Francisco	78%	80%	.155
Seattle	75%	76%	.1575†

Price of 60% Ammonia Gelatin is $0.01 per lb. higher than 40%

a Disc. from list Sept. 1939. *b* Also less 6% tax exemption. *d* Discount from jobbers' list Sept. 15, 1928. ‡ Plus sales tax.

• Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip. † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.11 -.1175	.135 -.1475	.155 -.1675
Rocky Mtn. States	.11 -.1225	.135 -.1525‡	.155 -.1725‡
Pacific N. W. States	.1075-.12	.1375-.15	.1575-.17
Pacific S. W. States	.1050-.1150	.135 -.145	.155 -.165

‡F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES—F.O.B.

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Leaf — Barge	Short Leaf — Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.22	$0.195
12 in.— 2 ft. from butt	6 in.	50 to 59 ft.	.26	.24
12 in.— 2 ft. from butt	6 in.	60 to 69 ft.	.28	.255
14 in.— 2 ft. from butt	6 in.	50 to 69 ft.	.30	.265
14 in.— 2 ft. from butt	6 in.	70 to 79 ft.	.36	.275
14 in.— 2 ft. from butt	5 in.	80 to 85 ft.	.42	.415
14 in.— 2 ft. from butt	5 in.	85 to 89 ft.	.45	.482

RAILWAY TIES

Prices f.o.b., per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr.
Boston	Oak	$1.30	....	$1.80	....
	Pine	1.60	$2.40*a*	2.40	$3.40*a*
New York	S. L. Sap Pine	1.30/1.40	2.35	1.60	2.60
	Mixed Oak	1.55	2.35	2.00	2.95
Birmingham	White Oak	.85	1.50*a*	1.35	1.70*a*
	Southern Pine	.55*b*	1.10*ab*	.70	1.30*a*
Chicago	Oak	....		....	
	Southern Pine	....		....	
Los Angeles	Douglas Fir	1.10	1.75*a*	1.60	2.50*a*
Philadelphia	Red Oak	....	....	....	....
St. Louis•	White Oak	1.40	....	1.75	....
	Red Oak	1.40	1.85*a*	1.75	2.35*a*
	Sap Pine or Cypress	1.30	....	1.65	....
San Francisco	Douglas Fir	1.00*bef*	....	....	2.45*caf*
Montreal	Birch or Maple	.65	1.05*a*	.75	1.35*a*

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6" x 8" x 8'6". *c* Empty cell. *d* Zinc. *e* Green. *f* At ships tackle. •August prices; none later quoted.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.00-2.85
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77-80%, flaked, in 400-lb. drums or 100-lb. moisture proof bags, delivered, per ton	20.50-39.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-25.00
Sulphate of copper, in bbl., per 100-lb	5.15-5.50

DU PONT CONSTRUCTION TOPICS DU PONT

"VENTUBE"* HELPS SPEED HARD ROCK TUNNELING

Proves outstanding versatility at Connecticut diversion tunnels

Unusual rock conditions were encountered in driving two water diversion tunnels for the Hemlocks Reservoir to supply Bridgeport, Conn. Despite these conditions, the Bridgeport Hydraulic Company advanced the work with record speed. This was made possible by delivering to the workmen at the heading a constant flow of fresh air through "Ventube" flexible ventilating duct.

Concussion from blasting was heavy, since the tunnel was of relatively small diameter (7 feet). The "Ventube" was maintained at about 75 feet from the heading during drilling operations. And just before shooting, it was removed from the supporting wire cable for a distance of 200 to 300 feet back from the heading to protect it from flying debris. The ease with which "Ventube" can be taken down and quickly reinstalled is a big advantage and is due to its compactness and its patented built-in suspension hooks, which readily adjust themselves on the wire cable.

Almost immediately after shooting, the air line was turned on, and two men would rehang the "Ventube." Fresh air then streamed over the muck pile and heading, and the tunnel foreman and his assistants were quickly able to resume their work.

**"Ventube" is Du Pont's registered trade mark for its rubber impregnated flexible ventilating duct.*

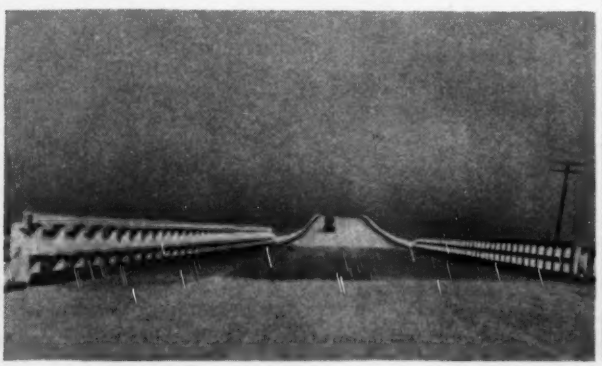
TIMBER BRIDGES GIVEN LONGER LIFE BY "CZC"

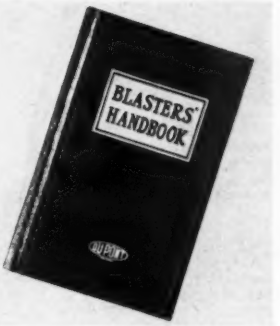
The present scarcity of structural steel for highway bridge construction has directed attention to the use of what, in many respects, is a new building material, namely, timber treated with Du Pont Chromated Zinc Chloride.

To all the natural advantages of wood, Du Pont "CZC" wood preservative adds the following values: (1) Durability and low maintenance cost, (2) Measurable fire protection, and (3) Maintenance of load bearing strength for the life of the structure.

Lumber treated with "CZC" outlasts ordinary timber many times because it is decay resistant and termite repellant, and maintains its full strength over long periods of time. In addition, lumber treated in this way is clean, odorless, and paintable.

Bridge construction is just one of the many ways in which lumber treated with "CZC" can help conserve steel for the defense program and at the same time do an excellent job. For further particulars on money-saving uses of "CZC"-treated lumber, send for your copy of "Facts about Lumber Pressure Treated with Du Pont 'CZC'."





NEW! BLASTERS' HANDBOOK

To meet industry's urgent need for up-to-the-minute facts on industrial explosives, du Pont has just released the 11th Edition of the Blasters' Handbook. Completely revised and expanded to 340 pages, the Handbook contains a wealth of information on the storage, handling and use of commercial blasting agents, supplies and accessories.

This new edition has been prepared by the Technical Section of the Du Pont Explosives Department. As the only reference work of its kind published in this country, it stands as still another evidence of du Pont's service to industry.

Price (Bound in "Fabrikoid") . $1.00

Send orders, with remittance enclosed to E. I du Pont de Nemours & Co. (Inc.), 2506-B Nemours Building, Wilmington, Del.

DID YOU KNOW?

. . . THAT Du Pont "Gelex"* semi-gelatin dynamite is being used more and more in tunnel work to replace the more expensive gelatin grades.

. . . THAT "CZC"-treated lumber is a recognized government standard covered by Master Federal Specification No. TT-W-571B.

. . . THAT Du Pont powder bags are made of the same sturdy material as is "Ventube"? That they have been tested for high insulating properties.

*Trade Mark

★ ★ E. I. DU PONT DE NEMOURS & COMPANY (INC.) WILMINGTON, DELAWARE ★ ★

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE — PARTITION — SCORED Per M. lots of 2,000 pieces or over, 3x12x12 in.	4x12x12 in.	8x12x12 in.	STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over, 8x12x12 in.	10x12x12 in.	12x12x12 in.	BRICK Per M. in quantity. Common backing	Straight hard	LIME Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized or lump
Atlanta	$100.00	$110.00	$195.00	$230.00	$240.00	$240.00	$13.50	$18.00	$26.50	$17.00	$17.00
Baltimore	87.50	95.00	170.00	200.00	250.00	300.00	14.00*k*	17.00*k*	19.50	17.50	2.75*m*
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.64	2.25*o*
Boston	118.25*u*	126.40*u*	235.50*u*	.....	.....	.....	18.00*i*	21.00*i*	20.00	15.00	2.80*p*
Chicago	68.10	72.60	135.90	185.70	234.90	268.10	11.50	12.50	16.40	14.40	12.20
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	17.50	17.50	15.40	12.90	.....
Cleveland	56.50	60.00	112.50	135.00	182.00	209.00	16.00	16.00	15.75*j*	14.50*j*	3.00*jm*
Dallas	52.00	54.00	100.00	135.00	200.00	263.00	11.50*i*	13.50*i*	19.00	15.00	.95*n*
Denver	84.80	94.40	152.70	178.20	212.00	227.90	13.50	17.00	30.00*j*	19.00*j*	30.00*j*
Detroit	74.50	81.60	153.00	194.00	253.00	289.00*e*	17.50	18.00	16.50	13.90	14.90
Kansas City	64.50	66.50	86.00*c*	125.50	159.75	186.25	16.00	24.00	19.10	12.80	10.70
Los Angeles	73.50†*r*	89.50†*r*	128.00*c*†*r*	210.00†*r*	368.00†*r*	460.00†*r*	13.50	15.00	16.50	17.50	17.50
Minneapolis	80.35	85.70	168.45	192.85	176.20	245.20	13.10	15.10*g*	21.00	16.00	19.00
Montreal	72.20*u**n*	77.50*u**n*	142.50*u**n*	76.00*u*†*n*	165.80*u**n*	248.70*u*	17.50†*u*	24.25†*u*	23.20*u*	17.00*u*	12.00*n*
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	78.40	83.60	115.00*c*	193.30*h*	238.80*h*	295.60*h*	13.00	.....	19.00	14.00	17.00
Philadelphia	80.50	85.90	161.10	193.30	238.80	295.60	17.00*s*	19.00*s*	15.70*q*	10.55*q*	13.05*q*
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40	2.55*m*
St. Louis	62.00	88.00	120.00	170.00	187.00	220.00	17.00	18.00	22.00	18.00	2.50*m*
San Francisco	84.00	94.50	225.00	.....	.....	.....	19.00	17.00	.75*o*	2.05*o*	16.40
Seattle	100.00	110.00	220.00	.....	.....	.....	17.50*f*	22.00*f*	20.00*s*	20.00*s*	20.00*s*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* 50c. per M. off for cash. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., 180 lb *n* Per sack 100 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *q* 25-ton cars. *r* 5% discount 10 days. *s* 2% off cash. *t* 5½ x 8 x 12. *u* Plus 8% sales tax.

PAINT, ROOFING—F.O.B. CARLOAD LOTS

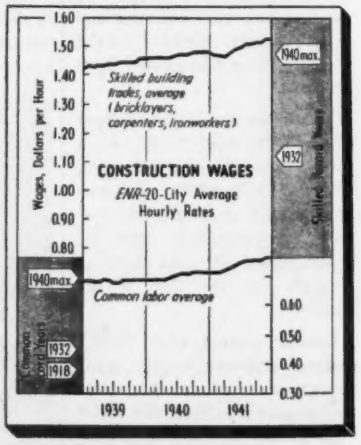
	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *c*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85-90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$9.50	$13.625	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27	$29.00
Baltimore	9.25	13.25	1.95	2.90	2.50	2.80	3.50	3.50	.80	2.75*m*
Birmingham	9.50	13.625	2.35	3.50	1.85	2.15	1.58	1.58	.32	27.00
Boston	9.25	13.25	2.30‡	2.75‡	2.00‡	2.02‡	1.85*h*‡	1.85*h*‡	.50‡	20.00‡
Chicago	9.25	13.25	2.11	2.63	1.72	1.48*h*/*f*	1.50*h*/*f*	1.50*h*/*f*	.26/*f*	22.00/*f*
Cincinnati	9.25	13.25	1.70	2.90	1.60	2.40	2.39*h*	2.39*h*	.36	21.00
Cleveland	9.25	13.25	2.70	3.50	2.25	1.93	1.83*h*	1.83*h*	.40	25.00
Dallas	9.25	14.00	1.88	2.11*n*	....	2.30*h*	2.25*h*	2.45*h*	.35	39.00
Denver	9.75	13.75	1.65	2.60	.27*l*	2.45	3.15	3.15	.35	28.00
Detroit	9.25	13.25	1.75	3.00	1.45	2.40	2.50	2.50	.35	26.00
Kansas City	9.25	13.275	2.39*g*	2.55*g**r*	2.16*g**n*	2.10	2.30	2.30	.28	27.50
Los Angeles	9.50	13.75	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	9.25	13.375	....	....	....	1.93*i*	1.75*h*/*i*	1.75*h*/*i*	.29	22.00
Montreal *p*	9.25	9.00	2.40	2.97	2.51	2.64	1.85	1.86	.63	1.85*k*
New York	9.25	13.25	2.03	2.55	1.64	2.01	1.83*h*	1.83*h*	.23	25.00
Philadelphia	9.25	13.25	....	....	....	....	....	....	...	.....
Pittsburgh	9.25	13.25	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34	26.00
St. Louis	9.25	13.25	1.90/2.00	2.60/2.80	1.60/2.00	1.92	1.91	1.91	.32	23.00
San Francisco	9.50	13.50	1.80	2.75*n*	1.10/2.00	1.89	2.66	2.66	.33	19.50
Seattle	9.50	13.75	1.80	2.60	....	2.12	1.45*h*	1.75	.35	24.15*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266-31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per 100 lb *l* Per lb. *m* Per bbl. *n* May price, no later quotation available. *p* Plus 8% sales tax. *r* Not available.

SKILLED AND COMMON WAGE RATES—PER HOUR

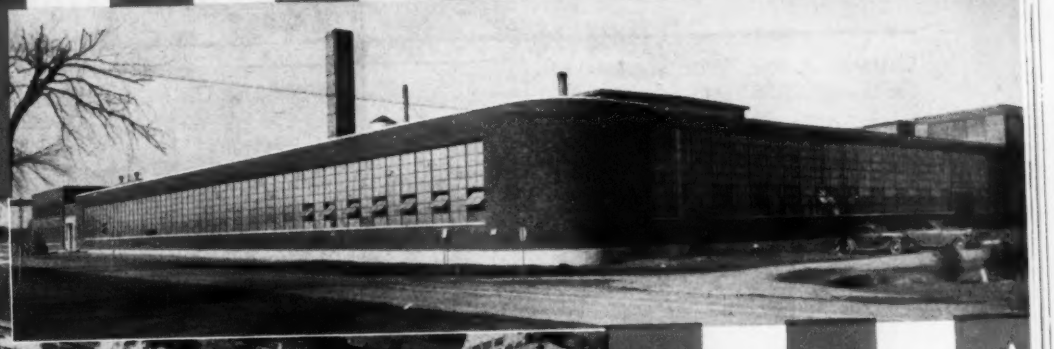
	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.375	$1.00	$1.375	$1.00/1.25	$1.25	$0.40	$0.50
Baltimore	1.625	1.375	1.65	1.65	1.50	.70	.70
Birmingham	1.50	1.125	1.50	1.50	1.50	.60	.45
Boston	1.50	1.25	1.50	1.625	1.625	.85	.85
Chicago	1.70	1.625	1.70	1.70	1.70	1.025	1.025
Cincinnati	1.625	1.50	1.55	1.325/1.525	1.625	.75	.75
Cleveland	1.75	1.50	1.75	1.75	1.75	1.00	1.00
Dallas	1.50	1.00	1.25	1.00	1.50	.50/.625	.50/.625
Denver	1.65*b*	1.43*b*	1.43*b*	1.43*b*	1.50*b*	.718*b*	.718*b*
Detroit	1.60	1.40	1.75	1.625	1.675	.80	.80
Kansas City	1.625	1.375	1.50	1.50	1.575	.85	.54
Los Angeles	1.50	1.175	1.50	1.50	1.667	.75	.75
Minneapolis	1.50	1.25	1.50	1.40	1.50*e*	.90	.90
New Orleans	1.50	1.25	1.50	1.375	1.375	.55	.55
New York	2.00*b*	1.85*b*	2.00	2.00*b*	2.00*c*	1.031	.95
Philadelphia	1.65*b*	1.40	1.65	1.50	1.75	.70	.70
Pittsburgh	1.90	1.50	1.75	1.25	1.75	.80	.70
St. Louis	1.25/1.50	1.50	1.75	1.50/2.00	1.25/1.75	.675/.875	.875
San Francisco	1.75*c*	1.375	1.60	1.50	1.667*e*	.85/.875	.85/.875
Seattle	1.65	1.35	1.55	1.50	1.65	.95	1.00
Montreal	.92	.81	.87	.76	.90	.53	.46

b 7 hr. day. *c* 6 hr. day. *d* 35 hr. wk. *e* 30 hr. wk.



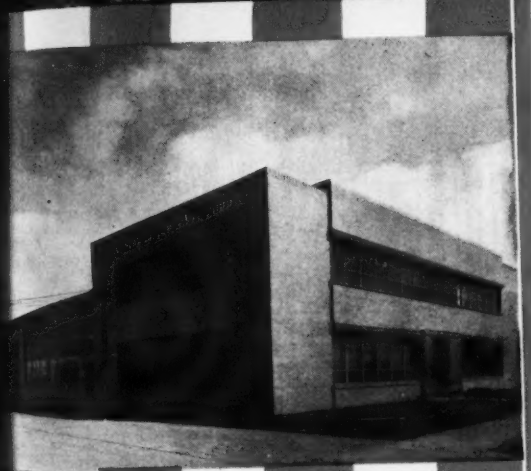
ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.521
ENR Common Average: $0.769

ROOFS over America!

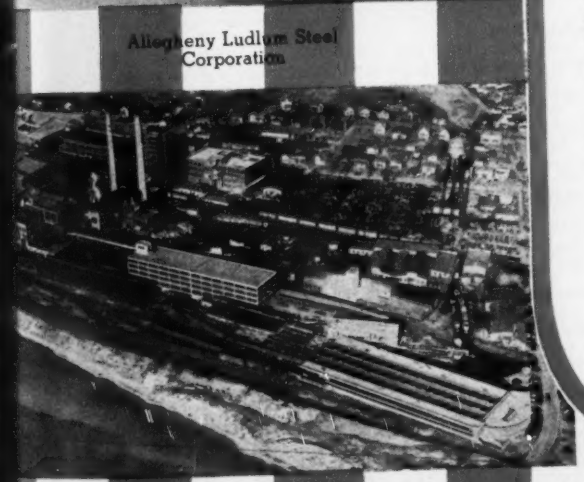


Below: Ames Baldwin Wyoming Co.

The Florence Stove Company



Allegheny Ludlum Steel Corporation



The Rath Packing Company

Procter & Gamble Company

Carey
BUILT-UP ROOFS

PROTECTING HUNDREDS OF MILLIONS OF DOLLARS INVESTED IN VITAL PLANTS AND EQUIPMENT THROUGHOUT THE NATION

Industry knows that CAREY Roofs make good. A study of the records of thousands of Carey Built-Up Roofs shows that many are still on the job after 25, 30, 35 and even 40 years of service.

The real reason for this exceptional service is simple and logical — over a half century of manufacturing experience, supported by serious scientific research.

Research, with CAREY, has never been "window dressing". For years CAREY has supported a research fellowship at the great Mellon Institute, University of Pittsburgh. And CAREY maintains, at its home plant, one of the best-equipped and best-manned research laboratories in the country, devoted to the betterment of roofings and other building materials. As a result of this research, numerous U. S. Patents have been issued, covering basic improvements in roofing materials and their method of production. The practical story of this progress is being told in longer wear and more economical service, on roofs all over America.

In these critical war days, dependable roof protection is doubly important. Whether you require new roofs, or re-roofing jobs, it will be to your advantage to discuss your needs with a Carey representative. A nation-wide organization of experienced roofing contractors is at your service. Write Dept. 30.

THE PHILIP CAREY MFG. COMPANY

Dependable Products Since 1873

LOCKLAND, CINCINNATI, OHIO

In Canada: **The Philip Carey Company, Ltd.**
Office and Factory: Lennoxville, P. Q.

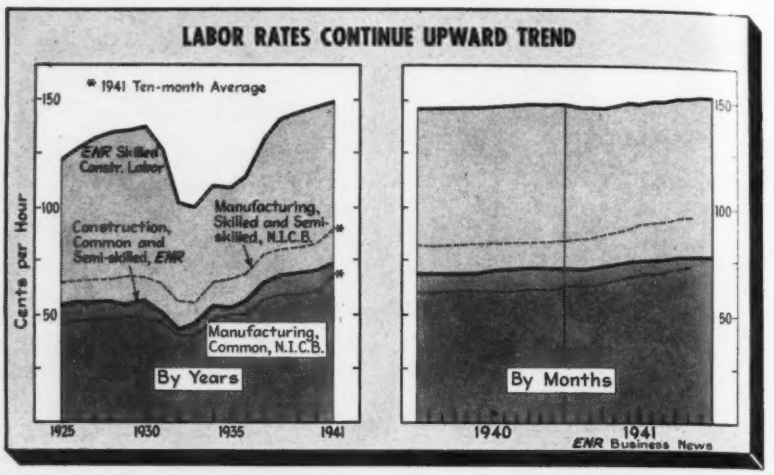
Construction Wage Rates and Trends

COMMON LABOR WAGE averages in the construction field reported by *ENR* for twenty cities began 1941 at 71.1c. per hour and rose almost steadily throughout the year, reaching 76.9c. in December. The result was a new record average hourly rate of 74.3c. per hour for 1941, an increase of 6.3 percent over the previous all-time high of last year.

The skilled construction average rate for twenty cities opened 1941 at $1.469 per hour, and with the exception of a slight decrease in March, and maintenance of previous month's levels in August, October and December, increased at a steady pace to $1.521 at the year's end.

The 1941 skilled labor average, $1.495, reached a new peak, 1.5 percent over the mark set in 1940.

Real income, that is, actual wages in relation to living costs, continued to improve for common construction labor, but the skilled workers' wage increases failed to offset the rise in the cost of living. The 1941 wage rate index for the construction industry, based on 1929 as 100, was 136.5 for common labor and 110 for skilled labor, gains of 6.3 and 1.5 percent, respectively, over last year. The Cost of Living Index computed by the N.I.C.B. increased 3.6 percent over a year ago.



Construction Wages—Rates per Hour

20-CITIES AVERAGE REPORTED BY ENGINEERING NEWS-RECORD

CONSTRUCTION WAGES	Skilled Aver.†	Common
1910	$0.525	$0.179
1911	.534	.179
1912	.542	.182
1913	.555	.19
1914	.565	.177
1915	.57	.182
1916	.58	.192
1917	.61	.281
1918	.68	.38
1919	.78	.466
1920	1.05	.579
1921	1.06	.54
1922	1.01	.442
1923	1.10	.518
1924	1.19	.555

Notes:

†*E N R* Skilled Average represents rates for bricklayers, carpenters, iron workers.

(1) Skilled and Semi-skilled.

(2) Unskilled.

Both represent earnings per hour as reported by N. I. C. B.

* Checked monthly. Reported in first issue of *E N R* each month.

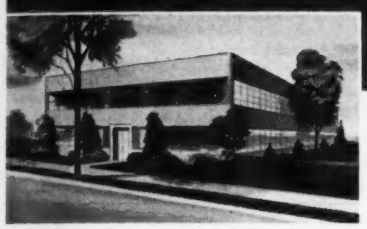
SKILLED LABOR †.

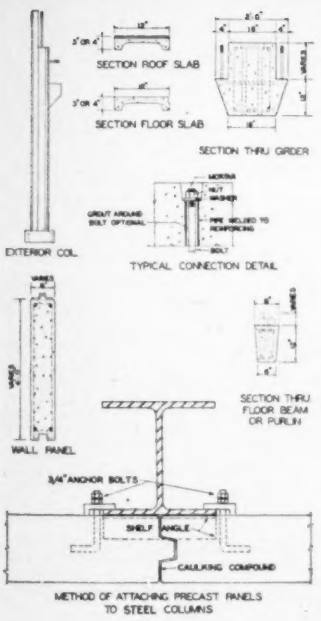
	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
J	$1.21	$1.24	$1.28	$1.34	$1.35	$1.37	$1.37	$1.15	$0.989	$1.054	$1.108	$1.119	$1.22	$1.39	$1.43	$1.47	$1.47	$1.53
F	1.21	1.24	1.32	1.34	1.35	1.38	1.37	1.11	.996	1.062	1.104	1.119	1.24	1.39	1.43	1.47	1.47	1.54
M	1.21	1.24	1.32	1.34	1.35	1.38	1.36	1.11	.991	1.069	1.092	1.132	1.25	1.40	1.43	1.47	1.47	1.54
A	1.22	1.25	1.30	1.35	1.35	1.38	1.36	.95	.997	1.084	1.093	1.134	1.26	1.40	1.44	1.47	1.48	1.54
M	1.22	1.26	1.31	1.36	1.35	1.38	1.36	.96	.998	1.101	1.081	1.138	1.30	1.40	1.44	1.47	1.49	.....
J	1.23	1.27	1.33	1.35	1.36	1.38	1.32	.99	.994	1.101	1.074	1.38	1.33	1.41	1.44	1.47	1.49	.....
J	1.22	1.27	1.33	1.35	1.36	1.38	1.23	1.00	.985	1.104	1.077	1.159	1.35	1.43	1.44	1.48	1.50	.....
A	1.23	1.28	1.34	1.35	1.37	1.39	1.19	.98	.986	1.110	1.088	1.159	1.37	1.43	1.44	1.48	1.50	.....
S	1.23	1.28	1.34	1.35	1.37	1.39	1.19	.99	1.016	1.119	1.088	1.159	1.37	1.43	1.44	1.48	1.52	.....
O	1.23	1.29	1.33	1.35	1.37	1.39	1.17	.98	1.029	1.120	1.104	1.176	1.38	1.43	1.44	1.48	1.52	.....
N	1.23	1.29	1.34	1.35	1.37	1.39	1.16	.97	1.037	1.120	1.101	1.178	1.38	1.43	1.46	1.48	1.52	.....
D	1.24	1.29	1.33	1.35	1.37	1.39	1.15	.98	1.062	1.120	1.101	1.180	1.39	1.43	1.46	1.48	1.52	.....
Aver.	**1.22**	**1.27**	**1.32**	**1.35**	**1.36**	**1.38**	**1.27**	**1.02**	**1.006**	**1.097**	**1.093**	**1.149**	**1.32**	**1.41**	**1.44**	**1.47**	**1.50**	.....
Mfg. (1)	.644	.651	.656	.659	.668	.662	.634	.559	.55	.642	.662	.685	.78	.80	.81	.83	.916	.....

COMMON LABOR *

	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
J	$0.55½	$0.54	$0.55½	$0.55	$0.559	$0.5628	$0.5384	$0.4524	$0.4271	$0.5158	$0.5376	$0.547	$0.603	$0.680	$0.682	$0.685	$0.711	$0.776
F	.54	.54	.55½	.54½	.564	.5628	.5428	.4521	.4285	.5268	.5241	.547	.603	.675	.680	.685	.713	.780
M	.54½	.54½	.56	.54½	.5509	.5610	.5371	.4358	.4272	.5268	.5243	.547	.612	.675	.680	.685	.716	.780
A	.54½	.54½	.56	.55	.529	.5646	.5350	.4122	.4343	.5343	.5255	.552	.612	.677	.683	.685	.725	.788
M	.54	.55	.55½	.55	.5315	.5628	.5394	.4105	.4442	.5343	.5233	.558	.627	.673	.682	.690	.741	.....
J	.53	.55	.55½	.55½	.534	.5628	.5394	.4121	.4393	.5343	.5269	.564	.644	.677	.684	.703	.747	.....
J	.53	.55½	.55½	.55½	.5296	.5615	.4721	.4114	.4430	.5300	.5289	.563	.662	.677	.684	.707	.753	.....
A	.53	.55½	.55½	.5607	.5353	.5615	.4634	.4220	.4430	.5300	.5285	.569	.668	.677	.685	.707	.753	.....
S	.53	.55½	.55½	.5607	.5496	.5609	.4665	.4308	.4524	.5349	.5285	.569	.673	.677	.685	.711	.761	.....
O	.54	.55	.54½	.5628	.5496	.5596	.4584	.4308	.5057	.5363	.5285	.583	.676	.682	.685	.711	.761	.....
N	.54	.55½	.54½	.5653	.5603	.5587	.4559	.4260	.5102	.5388	.5275	.583	.678	.682	.685	.711	.768	.....
D	.54	.55½	.55	.5628	.5653	.5503	.4534	.4273	.5202	.5413	.5275	.586	.678	.682	.685	.711	.769	.....
Aver.	**.538**	**.548**	**.554**	**.5558**	**.5465**	**.5607**	**.5002**	**.4269**	**.4562**	**.5319**	**.5276**	**.564**	**.645**	**.678**	**.683**	**.699**	**.743**	.....
Mfg. (2)	.455	.461	.472	.474	.486	.478	.461	.401	.401	.478	.494	.498	.568	.584	.594	.61	.682	.....

IMPORTANT ANNOUNCEMENT
concerning WARTIME buildings





Patents Pending

You can save STEEL and TIME with Cemenstone precast concrete units . . .

Less strategic materials required . . . up to 70% savings in steel made possible with precast concrete units.

Standard precast units permit speedy erection of fire resisting building even under adverse weather conditions.

Cemenstone buildings may be enlarged or dismantled and rebuilt without loss of precast concrete units.

Cemenstone Wall Panels are also ideally suited for structural framing.

Engineering and designing services are available.

The concrete used in Cemenstone units has an ultimate compression strength of 5,000 lbs. per sq. inch.

The Cemenstone system is well adapted to blackout industrial, commercial and many other types of buildings. Why not take advantage of this system which is designed to speed wartime construction while using less critical materials? Write for complete engineering details no matter what your present building requirements happen to be. No obligation.

The Cemenstone Company

First National Bank Building, Pittsburgh, Pennsylvania

Wage Rates per Hour
New York City

	Carpenters, 10 Hr. Day	Bricklayers, 8 Hr. Day	Masons' Laborers, 8 Hr. Day	Common Laborers, 10 Hr. Day	Structural Iron-Workers
1874	$0.23	$0.43	$0.18	$0.14	.....
1875	.22½	.37	.18	.14	.....
1876	.21	.31	.17	.14	.....
1877	.20	.31	.15	.12	.....
1878	.18	.31	.15	.11	.....
1879	.17	.31	.16	.11	.....
1880	.18	.34	.18	.12	.....
1881	.19	.46	.21	.13	.....
1882	.21	.50	.22	.15	.....
1883	.21	.50	.23	.15	.....
1884	.21	.50	.22	.13	.....
1885	.20	.50	.22	.13	.....
1886	.21	.50	.23	.13	.....
1887	.21	.50	.20	.14	.....
1888	.22	.50	.16	.12	.....
1889	.22	.50	.23	.13	.....
	8 Hr. Day			9 Hr. Day	
1890	.43	.47	.28	.14	.....
1891	.43	.47	.28	.14	.....
1892	.44	.50	.29	.14	.....
1893	.43	.50	.30	.14	.....
1894	.44	.50	.30	.14	.....
1895	.43	.50	.30	.14	.....
1896	.44	.50	.30	.14	.....
1897	.44	.50	.29	.14	.....
1898	.44	.50	.30	.14	.....
1899	.45	.55	.33	.14	.....
1900	.50	.56	.33	.14	.....
1901	.50	.59	.33	.19	.....
1902	.51	.65	.36	.17	.....
1903	.56	.65	.36	.16	.....
1904	.53	.65	.36	.19	.....
1905	.54	.70	.36	.20	.....
1906	.58	.70	.38	.21	.....
	*			—8 Hr. Day—	
1907	.62½	.70	.37½	.22	$0.60
1908	.62½	.70	.37½	.22	.60
1909	.62½	.70	.37½	.22	.60
1910	.62½	.70	.37½	.22	.62½
1911	.62½	.70	.37½	.22	.62½
1912	.62½	.70	.37½	.25	.62½
1913	.62½	.70	.37½	.22½	.62½
1914	.62½	.75	.37½	.22½	.62½
1915	.62½	.75	.37½	.25	.62½
1916	.62½	.75	.37½	.25	.66
1917	.69	.75	.42½	.30	.68
1918	.69	.81	.47	.40½	.80
1919	.75	.87½	.57½	.40½	.87½
1920	1.12½	1.25	.77½	.75	1.12½
1921	1.12½	1.25	.87½	.60	1.12½
1922	1.12½	1.25	.87½	.60	1.12½
1923	1.12½	1.50	.95	.61½	1.12½
1924	1.31½	1.50	1.00	.68½	1.29
1925	1.31½	1.50	1.00	.65½	1.46½
1926	1.45	1.64½	1.07	.81½	1.60
1927	1.50	1.75	1.12½	.90½	1.75
1928	1.50	1.75	1.12½	.90½	1.75
1929	1.55	1.84	1.15	.98½	1.81
1930	1.65	1.92½	1.03¾	1.03¾	1.92½
1931	1.45	1.71½	1.02½	.65½	1.92½
1932	1.33	1.47	1.00	.64½	1.67½
1933	1.37½	1.57½	.91	.72½	1.65
1934	1.40	1.53	.82½	.84½	1.62
1935	1.40	1.50	.82½	.68	1.65
1936	1.40	1.50	.82½	.65	1.58
1937	1.60	1.73	.91	.76	1.79
	—7 Hr. Day—				
1938	1.75	1.88½	.99¾	.91½	1.92½
1939	1.75	1.89½	1.03½	.91½	1.92½
1940	1.81	1.96	1.03½	.91½	1.96½
1941	1.85	2.00	1.03¼	.93¾	2.00
	1940 by months				
Jan.	1.75	1.90	1.03½	.87½/.95	1.92½
Feb.	1.75	1.90	1.03½	.87½/.95	1.92½
Mar.	1.75	1.90	1.03½	.87½/.95	1.92½
Apr.	1.75	1.90	1.03½	.87½/.95	1.92½
May	1.75	1.90	1.03½	.87½/.95	1.92½
June	1.85	2.00	1.03½	.87½/.95	1.92½
July	1.85	2.00	1.03½	.87½/.95	2.00
Aug.	1.85	2.00	1.03½	.87½/.95	2.00
Sept.	1.85	2.00	1.03½	.87½/.95	2.00
Oct.	1.85	2.00	1.03½	.87½/.95	2.00
Nov.	1.85	2.00	1.03½	.87½/.95	2.00
Dec.	1.85	2.00	1.03½	.87½/.95	2.00
	1941 by months				
Jan.	1.85	2.00	1.03½	.87½/.95	2.00
Feb.	1.85	2.00	1.03½	.87½/.95	2.00
Mar.	1.85	2.00	1.03½	.87½/.95	2.00
Apr.	1.85	2.00	1.03½	.87½/.95	2.00
May	1.85	2.00	1.03½	.87½/.95	2.00
June	1.85	2.00	1.03½	.95	2.00
July	1.85	2.00	1.03½	.95	2.00
Aug.	1.85	2.00	1.03½	.95	2.00
Sept.	1.85	2.00	1.03½	.95	2.00
Oct.	1.85	2.00	1.03½	.95	2.00
Nov.	1.85	2.00	1.03½	.95	2.00
Dec.	1.85	2.00	1.03½	.95	2.00
	1942 by months				
Jan.	1.85	2.00	1.03½	.95	2.00
Feb.	1.85	2.00	1.03½	.95	2.00
Mar.	1.85	2.00	1.03½	.95	2.00
Apr.	1.85	2.00	1.03¼	.95	2.00

Index of Union Hourly Wage Rates in Building Trades
1929 = 100

Industrial Relations Division
U. S. Department of Labor, Bureau of Labor Statistics

Year	All Building Trades	Journeymen	Helpers & Laborers	Bricklayers	Carpenters	Cement Finishers	Electricians (Inside Wiring)	Engineers (Portable & Hoisting)	Glaziers	Lathers	Painters	Plasterers	Plumbers & Gas Fitters	Sheet-Metal Workers	Steam & Sprinkler Fitters	Stonemasons	Structural Ironworkers	Building Laborers	Hod Carriers
1907	31.5	31.7	20.7	37.9	32.0	38.5	31.3	.....	.....	.....	27.5	39.9	37.8	33.8	33.8	34.7	31.8	35.0	33.1
1908	33.5	33.8	32.1	38.9	34.0	38.4	34.2	.....	.....	.....	30.5	39.8	38.2	34.5	34.2	35.2	34.7	35.2	33.2
1909	35.1	35.5	33.2	39.7	35.9	39.6	35.3	.....	.....	.....	32.6	40.1	38.8	34.7	38.9	35.3	37.2	35.3	33.7
1910	36.5	37.0	34.3	40.4	37.6	40.0	36.3	.....	.....	.....	34.6	40.5	39.1	35.7	36.1	35.6	39.5	36.7	33.8
1911	37.1	37.6	34.5	40.4	38.1	41.5	36.7	.....	.....	.....	35.3	40.8	41.4	36.8	37.3	36.0	40.5	36.8	34.1
1912	37.9	38.5	34.8	41.0	38.9	41.5	37.1	41.8	.....	39.4	35.7	41.6	41.6	37.6	37.9	36.4	41.2	37.2	34.3
1913	38.8	39.4	35.8	41.7	39.5	42.5	37.9	43.0	.....	40.3	37.3	42.0	43.0	39.3	39.3	37.6	42.5	38.8	34.8
1914	39.6	40.3	36.2	42.8	40.1	42.9	39.1	43.6	.....	41.0	38.5	42.2	43.6	40.7	40.0	38.7	43.3	39.2	35.2
1915	39.9	40.6	36.5	42.9	40.6	43.3	39.9	43.6	.....	41.5	38.7	42.4	43.9	41.3	40.9	39.1	43.3	39.4	35.4
1916	41.2	42.0	37.7	43.3	41.8	43.7	40.7	44.1	.....	42.7	42.3	43.9	44.3	42.0	41.7	39.7	44.0	41.2	36.5
1917	43.8	44.3	41.4	44.8	45.5	46.2	43.3	46.5	.....	44.4	43.6	45.2	45.8	43.8	43.3	41.2	46.6	45.5	40.7
1918	48.6	49.0	48.0	48.1	50.5	51.0	48.2	53.2	45.9	47.9	48.1	47.6	50.6	51.3	47.3	45.2	53.4	53.4	47.5
1919	55.7	56.0	55.5	53.4	58.2	57.2	55.2	58.3	49.1	53.3	56.3	54.9	57.2	56.6	53.2	50.7	60.1	60.5	55.6
1920	75.2	74.9	80.5	72.8	77.8	77.7	72.8	75.5	71.0	76.0	76.7	71.7	74.0	75.9	70.2	70.7	76.2	87.7	80.8
1921	76.6	76.3	81.3	72.3	78.4	80.3	75.4	76.7	72.2	77.2	78.9	75.6	77.4	78.7	71.1	72.4	77.6	88.2	81.2
1922	71.8	71.9	74.0	70.4	72.7	74.5	71.1	72.2	72.4	72.5	73.8	72.7	71.9	73.0	69.5	67.4	70.5	82.8	67.3
1923	79.4	79.2	78.5	79.7	81.0	81.5	73.8	79.8	76.7	80.1	81.0	81.0	79.4	78.6	72.9	79.7	75.1	84.4	73.5
1924	85.7	85.6	84.9	84.3	86.7	90.1	82.4	84.8	80.9	86.4	85.3	90.6	86.6	86.3	83.6	84.5	85.0	93.9	76.8
1925	89.0	88.8	87.7	89.2	88.5	90.6	86.7	88.5	90.0	94.2	90.0	92.1	88.4	89.2	88.0	86.1	85.9	89.7	85.8
1926	94.8	94.7	95.6	94.7	95.0	96.7	91.3	93.4	91.2	96.6	95.4	98.9	95.2	95.3	95.3	94.9	92.4	98.7	93.5
1927	98.1	97.9	97.3	97.0	98.1	101.0	95.1	96.4	97.4	100.5	98.6	101.0	97.2	98.2	98.0	96.1	99.0	99.1	95.7
1928	98.7	98.7	98.3	97.8	98.4	100.0	96.0	100.4	98.5	100.8	100.2	101.2	99.2	96.3	99.4	97.3	99.2	99.5	95.8
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	104.2	104.1	105.1	102.4	104.0	106.6	101.8	107.7	104.6	104.3	105.6	105.0	103.9	104.6	104.9	101.5	105.5	105.5	103.8
1931	104.5	104.5	104.5	102.2	104.2	107.0	103.2	107.7	105.3	103.7	106.1	104.7	105.1	106.2	105.5	102.0	106.5	103.9	103.5
1932	89.3	89.3	89.2	87.5	85.4	93.4	98.5	100.7	88.2	93.1	89.6	87.1	91.4	92.1	90.9	90.5	92.3	89.4	85.8
1933	86.8	86.9	85.2	85.2	85.2	91.2	89.9	99.6	88.0	89.7	87.8	83.7	90.6	89.4	88.2	84.5	91.3	84.2	84.7
1934	87.4	87.4	87.7	84.5	86.7	92.1	90.1	101.4	93.2	92.1	86.4	84.6	91.4	89.7	89.2	84.4	92.5	87.3	90.3
1935	88.4	88.4	88.2	84.2	87.8	92.6	94.4	103.1	94.1	93.1	86.7	85.6	92.8	90.4	90.7	84.2	93.2	88.6	87.4
1936	91.6	91.3	93.4	84.7	92.3	95.0	96.9	104.2	95.5	95.5	91.1	86.1	95.2	92.2	93.7	85.2	95.6	96.2	92.1
1937	98.9	97.6	101.5	90.6	98.3	101.9	101.1	112.6	104.6	101.8	97.7	94.9	100.4	98.9	98.8	94.1	104.4	105.3	99.1
1938	106.7	106.1	111.7	100.1	107.1	111.3	111.4	116.0	112.2	112.7	104.2	106.1	112.5	108.8	111.4	102.1	112.7	112.9	109.1
1939	107.4	106.8	112.6	100.6	107.3	111.7	112.0	117.4	113.0	116.4	105.0	107.0	113.5	110.4	112.2	102.4	114.0	113.6	109.4
1940	109.1	108.3	114.8	102.8	110.0	112.7	113.9	118.4	114.3	117.2	105.2	107.5	115.3	112.4	112.5	101.9	114.4	115.4	113.6
1941	113.1	112.1	120.3	105.2	112.5	116.7	119.1	122.2	117.9	121.6	112.2	109.4	120.3	117.6	116.0	104.5	119.9	122.2	117.4

Index of Weekly Hours in Union Building Trades
1929 = 100

Industrial Relations Division
U. S. Department of Labor, Bureau of Labor Statistics

Year	All Building Trades	Journeymen	Helpers & Laborers	Bricklayers	Carpenters	Cement Finishers	Electricians (Inside Wiring)	Engineers (Portable & Hoisting)	Glaziers	Lathers	Painters	Plasterers	Plumbers & Gas Fitters	Sheet-Metal Workers	Steam & Sprinkler Fitters	Stonemasons	Structural Ironworkers	Building Laborers	Hod Carriers
1907	110.0	109.3	113.1	112.0	107.2	109.1	110.3	.....	.....	.....	114.1	108.8	104.7	105.4	105.9	106.8	108.1	108.5	110.5
1908	108.3	107.7	110.8	109.6	105.6	108.1	109.5	.....	.....	.....	112.3	108.3	104.8	105.3	105.9	106.8	105.9	108.5	110.5
1909	106.8	106.4	108.5	107.3	104.4	108.9	108.8	.....	.....	.....	110.7	108.3	104.8	105.3	105.6	106.8	104.5	108.1	110.1
1910	105.5	105.2	106.6	105.3	103.1	108.7	108.2	.....	.....	.....	109.3	108.2	104.6	105.3	105.0	105.2	103.4	105.5	109.2
1911	105.1	104.8	106.4	104.9	102.6	107.7	108.0	.....	.....	.....	108.6	108.8	104.3	105.0	104.9	104.5	103.2	105.5	108.6
1912	104.8	104.5	106.1	104.9	102.5	107.7	107.6	105.6	.....	104.0	108.5	107.5	103.5	103.7	104.2	104.5	102.1	105.5	107.8
1913	104.6	104.2	106.1	104.7	102.4	106.5	107.2	104.1	.....	104.0	107.9	107.5	103.5	103.5	103.8	104.4	101.7	105.5	107.8
1914	104.2	103.9	105.5	104.2	102.0	105.8	106.8	104.0	.....	104.0	107.6	107.4	103.1	103.4	102.5	104.4	101.5	105.2	106.4
1915	104.1	103.8	105.4	104.1	102.0	105.8	106.2	103.5	.....	103.5	107.6	106.9	103.1	103.2	102.5	104.3	101.5	105.2	106.4
1916	103.7	103.4	105.1	103.9	102.0	104.2	105.3	103.1	.....	103.5	106.9	105.8	102.6	102.8	102.2	104.1	101.2	104.6	106.4
1917	103.5	103.2	104.7	103.6	102.0	103.0	104.9	102.4	.....	103.0	106.8	105.7	102.5	102.7	102.1	104.0	101.0	103.5	106.3
1918	102.9	102.6	104.3	103.6	100.9	102.5	104.2	100.8	101.6	103.0	106.3	105.4	101.6	101.6	101.1	104.0	100.7	103.0	106.3
1919	102.4	102.2	103.3	103.4	100.3	101.7	103.3	100.3	101.6	102.7	106.1	105.4	101.3	101.2	101.0	103.4	100.5	101.1	105.9
1920	101.9	101.7	102.7	103.3	100.4	101.2	103.0	99.8	101.2	102.1	103.0	105.2	101.3	100.8	100.9	103.4	100.5	100.0	105.7
1921	101.8	101.6	102.7	103.3	100.3	101.2	103.0	99.4	101.6	101.9	103.1	104.9	101.1	100.8	100.8	103.5	100.5	100.0	105.7
1922	101.8	101.7	102.4	103.3	100.4	101.1	103.0	99.1	101.7	102.0	103.9	105.0	101.1	100.7	100.8	103.4	100.5	99.3	105.9
1923	101.9	101.8	102.6	103.3	100.7	101.1	103.0	98.7	101.2	102.3	103.6	105.5	101.1	100.7	100.8	103.4	100.5	100.0	105.9
1924	101.9	101.8	102.6	103.2	100.6	101.1	102.9	98.7	101.2	102.1	103.5	105.6	101.1	100.7	100.8	103.1	100.5	99.7	105.8
1925	101.9	101.8	102.4	103.1	100.6	100.8	102.9	99.0	100.8	101.8	103.8	105.3	101.1	100.7	100.8	103.1	100.2	99.8	105.7
1926	101.7	101.6	102.2	103.2	100.6	100.8	102.9	99.2	101.2	101.5	103.4	102.2	101.1	100.7	100.7	103.3	100.5	100.0	105.8
1927	101.5	101.4	102.2	102.7	100.6	100.5	102.9	100.8	101.5	101.0	103.0	101.8	100.9	100.4	100.5	103.1	100.5	100.2	105.8
1928	100.9	100.7	102.1	102.7	100.0	99.9	102.4	99.7	101.1	100.5	100.3	100.9	100.9	100.1	100.5	103.0	100.4	100.1	105.8
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	97.2	97.1	97.8	97.6	96.9	96.1	97.6	95.1	96.8	94.3	98.9	97.7	95.4	96.3	95.5	96.6	96.9	98.1	99.3
1931	96.0	95.8	97.0	96.1	95.4	95.0	96.6	93.7	95.1	93.8	98.0	97.0	94.1	94.7	94.5	94.9	95.8	97.0	98.8
1932	94.3	94.1	94.8	93.9	93.0	93.9	94.3	92.6	92.9	93.3	97.9	95.2	93.7	93.3	93.6	94.5	93.4	93.6	96.6
1933	94.0	93.8	94.4	94.9	91.6	95.7	94.3	91.7	92.9	92.9	97.7	97.2	93.3	93.2	93.1	93.8	93.1	93.2	96.1
1934	90.5	90.3	91.4	93.3	90.8	92.2	88.7	89.7	88.1	87.5	85.6	93.1	92.4	91.5	92.5	93.4	91.8	89.1	94.3
1935	89.8	89.6	90.8	93.2	90.4	92.0	85.1	89.2	87.5	87.4	85.5	91.6	91.8	92.0	92.2	93.3	90.7	89.0	94.2
1936	89.8	89.6	91.0	93.2	90.5	91.6	85.4	89.7	87.8	86.5	85.9	90.1	90.6	91.9	92.4	93.3	90.6	89.5	94.0
1937	90.2	90.0	91.3	94.1	90.3	91.7	89.6	89.5	87.9	87.7	85.9	90.2	91.1	92.0	92.5	93.3	90.2	89.7	94.3
1938	88.7	88.4	89.9	91.0	88.6	88.9	89.1	89.3	86.3	86.1	86.0	86.5	86.5	90.1	87.6	90.2	89.2	89.3	93.2
1939	88.5	88.3	89.7	91.1	88.6	88.9	88.8	89.2	86.1	85.4	85.7	86.5	86.8	90.1	88.0	90.2	89.1	89.2	92.9
1940	88.4	88.3	89.2	90.8	88.6	89.1	88.8	89.1	86.1	85.2	86.1	86.3	85.9	90.1	88.0	90.1	89.1	88.7	92.8
1941	88.8	88.7	89.4	91.0	89.1	89.5	89.3	88.8	86.6	86.0	86.3	86.6	86.3	90.8	88.5	90.2	89.5	88.9	92.7

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Building Trades Wage Rates Prevailing March 1, 1942

Compiled by Engineering News-Record

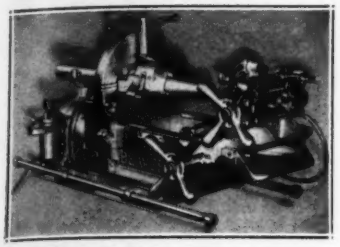
City and State	Carpenters	Bricklayers	Structural Ironworkers	Common Labor Buildings	Common Labor Hvy. Constr.	Stone Masons	Mason's Helpers	Plasterers	Mosaic and Terrazzo	Tile Layers	Cement Finishers	Lathers	Electric Workers (Inside)	Painters	Glaziers	Plumbers	Steamfitters	Roofers	Waterproofers	Sheet Metal Workers	Welders	Hoisting Engr., 1-Drum	Hoisting Engr., 2-Drum	Tractor Operator (Over 30-hp.)	Power Shovel Operator	Truck Drivers (Over 1½-Ton)
Albany, N. Y.	$1.38	$1.63	$1.63	$0.75	$0.75	$1.63	$0.75	$1.63	$1.58	$1.58	$1.63	$1.63	$1.50	$1.38	$1.25	$1.38	$1.38	$1.38	$1.38	$1.38	†	$1.65	$1.75	$1.40	$1.90	$0.75
Anderson, Ind.	1.25	1.64	1.65	.80	.80	1.64	1.00	1.63	.....	.....	1.38	1.50	.....	1.10	1.55	.....	.....	.....	.....	.....	.....	1.50	1.50	1.50	1.50	.80
Atlanta, Ga.	1.25	1.50	1.38	.50	.50	1.50	.50	1.50	1.50	1.50	1.50	1.50	.....	1.13	1.25	1.50	1.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Austin, Tex.	1.25	1.65	1.50	.40	.50	1.50	.65	1.75	1.50	1.50	1.50	1.50	1.50	1.13	1.13	1.13	1.50	1.50	1.00	.....	1.13	$1.50	1.25	1.50	1.25	1.38	1.00
Baltimore, Md.	1.38	1.63	1.65	.70	.70	1.63	.95	1.50	1.38	1.38	1.50	1.65	1.25	1.25	1.50	1.50	1.25	1.25	1.25	1.50	†	1.38	1.63	.88	1.63	.70
Birmingham, Ala.	1.25	1.75	1.50	.55	.65	1.75	.65	1.50	1.75	1.75	1.50	1.25	1.50	1.25	1.25	1.50	1.50	1.40	1.50	1.40	†	1.25	1.50	1.25	1.50	.75
Bismarck, N. D.	1.00	1.40	1.25	.55	.55	1.40	.50	1.25	.....	1.40	1.25	1.00	1.00	.85	.85	1.00	.....	.....	.90	.90	1.00	.90	1.00	.70	.90	.70
Boise, Idaho	1.13	1.50	1.50	.75	.75	.....	.....	1.50	.....	.....	1.25	1.50	1.50	1.13	1.13	1.25	1.50	1.00	.....	1.00	1.25	1.25	1.50	1.25	1.50	.75
Boston, Mass.	1.38	1.50	1.50	.85	.85	.....	.....	1.63	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.88	.....	.....	.....	.....
Charleston, S. C.	1.25	1.50	1.50	.40	.60	1.50	.60	1.25	1.50	1.50	1.25	1.25	1.50	1.25	1.00	[1] 1.50	1.50	1.00	.....	1.13	1.50	1.00	1.25	1.00	1.50	.75
Charleston, W. Va.[2]	1.38	1.65	1.50	.60	.60	1.65	.75	1.38	1.38	1.38	1.10	1.38	1.50	1.38	1.00	1.50	1.50	1.13	1.13	1.25	1.50	1.50	1.50	1.25	1.50	.88
Chattanooga, Tenn.	1.25	1.50	1.50	.50	.60	1.50	.60	1.50	1.50	1.50	1.38	.....	1.38	1.25	.85	1.75	1.75	1.25	.....	1.38	†	1.00	1.25	1.00	1.50	.65
Cheyenne, Wyo.	1.13	1.50	1.38	.65	.65	1.50	1.00	1.50	1.50	1.50	1.25	1.50	1.25	1.13	1.13	1.20	1.20	1.13	.....	1.25	.....	1.00	1.25	1.25	1.50	.75
Chicago, Ill.	1.63	1.70	1.70	1.03	1.03	.....	.....	1.83	.....	.....	.....	.....	1.70	1.73	2.00	1.70	1.70	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati, Ohio	1.50	1.75	1.63	.80	.80	1.63	.80	1.63	1.25	1.40	1.45	1.63	1.65	1.35	1.75	1.50	1.50	1.50	1.50	1.50	†	1.40	1.55	1.00	1.55	.80
Cleveland, Ohio	1.50	1.75	1.75	1.00	1.00	1.50	1.10	1.75	1.63	1.63	1.50	1.75	1.75	1.40	1.63	1.63	1.63	1.75	1.50	1.50	1.75	1.50	.....	1.30	1.50	1.10
Columbia, S. C.	1.00	1.25	1.25	.40	.40	1.25	.50	1.25	1.25	1.25	1.00	1.25	1.25	1.00	1.00	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00	.55	.55	.40
Columbus, Ohio	1.38	1.75	1.63	.65	.65	1.45	.88	1.55	1.25	1.25	1.25	1.55	1.38	[3] 1.25	1.15	1.50	1.50	1.20	1.20	[3] 1.38	1.63	1.30	1.30	1.15	1.63	.75
Concord, N. H.	1.00	1.50	1.68	.63	.63	.....	.80	1.50	.....	1.50	.....	1.38	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.....	.....	.....	.....	.....	.....
Conway, Ark.	.65	1.25	.....	.40	.30	1.25	.40	1.00	1.50	1.50	1.00	.80	1.38	.80	.60	1.25	.....	.60	.80	.....	.....	.....	.....	.....	.....	.....
Dallas, Tex.	1.25	1.63	1.50	.50	.63	1.63	.63	1.75	1.63	1.63	1.50	1.75	1.63	1.25	1.25	1.75	1.75	.88	.88	1.63	†	1.25	1.38	.75	1.25	.65
Dayton, Ohio	1.50	1.75	1.65	.70	.75	1.75	1.00	1.60	.....	1.65	1.35	1.60	1.75	1.38	1.45	1.50	1.50	1.35	.....	1.50	.....	.....	1.65	1.35	1.65	.85
Denver, Colo.[4]	1.50	1.65	1.43	.80	.80	1.65	1.10	1.50	1.50	1.50	1.50	1.50	1.50	1.43	1.30	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.63	1.50	1.63	1.00
Detroit, Mich.[5]	1.40	1.60	1.75	.88	.88	1.63	.88	1.68	1.50	1.63	1.40	1.68	1.75	1.38	1.25	1.75	1.75	1.75	1.40	1.50	1.75	1.63	1.75	1.68	1.68	1.00
Duluth, Minn.[5]	1.19	1.25	1.50	.70	.70	1.25	1.00	1.35	1.25	1.25	1.00	1.35	1.25	1.13	.85	1.25	1.25	1.10	1.10	1.20	1.25	1.40	1.40	1.20	1.50	.65
East Lansing, Mich.	1.40	1.65	1.75	.75	.75	1.65	.85	1.65	1.25	1.50	1.38	1.50	1.38	1.38	1.25	1.50	1.50	1.25	1.25	1.25	1.38	1.63	1.75	1.50	1.63	.80
Fort Worth, Tex.	1.13	1.50	1.50	.50	.50	1.50	.65	1.50	1.50	1.50	1.25	1.50	1.50	1.13	1.13	1.50	1.50	1.00	1.00	1.50	1.50	1.00	1.25	.75	1.25	.65
Frankfort, Ky.	1.10	1.50	1.50	.60	.60	1.63	.80	1.38	.90	1.63	1.38	1.25	1.50	.90	1.00	1.50	1.50	1.00	1.00	1.00	1.50	1.25	1.50	1.00	1.00	.75
Harrisburg, Pa.	1.13	1.63	1.80	.65	.85	1.63	1.00	1.50	1.50	1.40	1.50	1.38	1.50	1.00	1.50	1.40	1.40	1.00	1.00	1.50	1.50	1.65	1.90	1.65	1.93	.70
Helena, Mont.	1.25	1.50	1.50	.90	.90	1.50	1.00	1.50	1.50	1.50	1.50	1.50	1.25	1.25	1.25	1.50	1.50	1.25	1.25	1.25	1.15	1.00	1.50	1.50	1.50	.95
Houston, Tex.	1.38	1.63	1.50	.50	.50	1.63	.75	1.63	1.50	1.50	1.50	1.63	1.63	1.25	1.25	1.63	1.63	1.50	1.13	1.63	†	1.25	.....	1.25	1.50	.60
Indianapolis, Ind.	1.43	1.68	1.65	.75	.75	1.68	1.06	1.63	1.15	1.50	1.25	1.50	1.50	1.30	1.38	1.50	1.50	1.25	1.25	1.39	1.50	1.50	1.50	1.00	1.50	.75
Jackson, Miss.	1.25	1.50	2.00	.40	.50	1.50	.45	1.25	1.25	1.25	1.25	1.30	1.25	1.00	1.25	1.50	1.50	.88	.....	.90	1.50	1.00	1.00	.75	1.50	.60
Jacksonville, Fla.	1.13	1.50	1.50	.50	.60	1.50	.60	1.50	.....	1.50	1.00	.....	1.50	1.50	1.00	1.50	1.50	1.13	.....	1.25	1.07	1.38	1.50	1.13	1.50	.75
Jamestown, N. Y.	[6] 1.25	1.75	1.75	.75	.75	1.50	.85	1.50	1.25	1.25	1.25	1.25	1.65	1.10	1.00	1.50	1.50	1.00	1.75	1.00	1.50	1.00	1.25	.85	1.50	.85
Jefferson City, Mo.	1.00	1.50	1.75	.65	.65	.....	.....	1.50	1.25	1.25	1.50	1.00	1.50	1.00	1.00	1.25	1.25	1.00	.....	1.25	1.75	1.50	1.50	1.50	2.00	.95
Kansas City, M.	1.38	1.63	1.50	.85	.85	1.38	.90	1.58	1.38	1.38	1.38	1.50	1.50	1.38	1.50	1.50	1.50	1.25	1.38	1.50	1.50	1.38	1.50	1.25	1.50	.80
Lexington, Ky.	1.25	1.50	1.50	.60	.90	1.63	.60	1.25	.90	1.00	1.25	1.25	1.50	1.10	1.00	1.50	1.50	1.00	1.00	1.00	1.50	1.25	1.50	.90	1.25	.75
Lincoln, Neb.	1.38	1.50	1.50	.60	.60	1.50	.60	1.38	.....	1.25	1.25	1.38	1.50	1.38	1.15	1.38	1.38	1.10	1.00	1.25	†	1.25	1.25	1.13	1.50	.70
Louisville, Ky.	1.37	1.63	1.50	.68	.68	1.63	.68	1.63	1.25	1.25	1.38	1.50	1.50	1.25	1.20	1.63	1.63	1.25	1.25	1.38	†	1.00	.....	.90	1.25	.80
Los Angeles	1.18	1.50	1.50	.75	.75	.....	.....	1.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	.....	.....	.....	.....	.....
Meridian, Miss.	1.25	1.50	2.00	.40	.50	1.25	.40	1.50	1.25	1.25	1.25	1.30	1.25	1.00	1.00	1.25	1.30	[7] .75	.....	.90	1.25	.60	1.00	.75	1.50	.60
Milwaukee, Wis.[4]	1.30	1.60	1.50	1.00	1.05	1.60	.....	1.50	1.50	1.50	1.30	1.50	1.50	1.38	1.30	1.50	1.50	1.35	1.20	1.40	1.50	1.35	1.35	1.30	1.65	1.00
Minneapolis, Minn.[5]	1.25	1.50	1.50	.90	.90	1.50	1.00	1.50	1.30	1.38	1.25	1.50	1.50	1.25	1.20	1.50	1.50	1.20	1.20	1.38	1.07	1.40	1.40	1.37	1.75	.86
Mobile, Ala.	1.38	1.63	1.50	.65	.65	1.63	.75	1.38	1.63	1.63	1.38	1.50	1.50	1.13	1.25	1.75	1.75	1.38	1.38	1.25	†	1.50	1.50	1.25	1.50	1.00
Nashville, Tenn.	1.25	1.63	1.25	.45	.45	1.63	.55	1.50	1.63	1.25	1.38	1.50	1.38	1.13	1.00	1.50	1.50	1.13	1.00	1.25	†	1.00	1.25	1.00	1.25	.65
Newark, N. J.	1.75	1.95	2.00	1.13	1.13	1.95	1.13	1.95	1.75	1.75	1.95	1.90	2.00	1.57	1.56	1.75	1.75	1.74	1.74	1.65	1.75	2.00	2.00	2.00	2.00	1.00
New Orleans, La.	1.25	1.50	1.50	.60	.60	1.50	.70	1.38	1.50	1.50	1.25	1.50	1.50	1.00	1.31	1.50	1.50	1.13	1.13	1.25	1.25	1.13	1.38	1.38	1.38	.50
New York, N. Y.	1.85	2.00	2.00	1.03	.95	2.00	1.21	2.00	1.75	1.75	1.85	1.85	2.00	1.60	1.89	2.00	2.00	2.00	1.70	2.00	†	1.75	2.03	1.38	2.25	1.06
Oklahoma City, Okla.	1.25	1.50	1.50	.75	.50	1.50	.75	1.50	1.50	1.50	1.25	1.25	1.50	1.13	1.25	1.50	1.50	1.25	1.25	1.50	1.25	1.00	1.50	1.25	1.50	.75
Olympia, Wash.	1.50	1.75	1.65	1.00	1.00	1.75	1.35	1.75	1.38	1.75	1.38	1.50	1.50	1.33	1.25	1.75	1.75	1.40	1.40	1.40	1.15	1.75	1.75	1.85	1.85	1.25
Omaha, Neb.	1.25	1.45	1.38	.60	.75	1.38	.60	1.38	1.38	1.38	1.25	1.38	1.50	1.13	1.15	1.50	1.50	.95	.95	1.25	1.38	1.25	1.38	1.38	1.38	.75
Orlando, Fla.	1.00	1.25	1.38	.40	.50	1.25	.60	1.00	1.25	1.25	1.00	.75	1.15	.75	.75	1.25	1.25	1.00	1.00	1.10	1.38	1.38	1.38	.60	.75	.50
Philadelphia, Pa.	1.50	1.83	1.80	.75	.78	1.25	1.20	1.88	1.50	1.50	1.50	1.69	1.75	1.38	1.50	1.50	1.50	1.50	1.20	1.63	1.63	1.65	1.90	1.65	1.93	.80
Phoenix, Ariz.	1.25	1.65	1.50	.83	.90	1.65	.88	1.50	1.65	1.65	1.38	1.25	1.25	1.13	1.13	1.38	1.38	1.25	.....	1.25	1.50	1.38	1.38	1.25	1.63	1.00
Pierre, S. D.	1.00	1.00	1.00	.45	.45	1.00	.55	1.00	1.00	1.00	.85	.85	1.00	1.00	1.00	1.00	1.00	.90	.85	1.00	1.00	1.00	1.00	.75	1.00	.55
Pittsburgh, Pa.	1.50	1.90	1.75	.80	.70	1.63	1.13	1.75	1.50	1.50	1.50	1.75	1.75	1.50	1.40	1.75	1.75	1.50	1.50	1.63	1.50	1.56	1.63	1.56	1.63	.85
Raleigh, N. C.	.75	1.25	1.25	.30	.40	1.25	.40	1.25	1.25	1.25	.90	1.25	.90	.90	.90	1.25	1.25	.90	.75	1.25	1.25	.60	1.00	.50	1.25	.40
Richmond, Va.	1.13	1.50	1.50	.40	.....	.....	.....	.....	1.50	1.25	1.38	1.50	1.50	.90	.81	1.50	1.50	.....	.....	1.25	†	1.25	1.50	1.50	1.50	.75
St. Louis, Mo.	1.50	1.50	1.75	.88	1.00	1.25	1.00	1.75	1.30	1.50	1.58	1.63	1.50	1.50	1.50	1.63	1.63	1.75	1.58	1.50	1.50	1.50	2.00	2.00	2.00	1.00
Salt Lake City, Utah.	1.25	1.50	[3] 1.50	.75	[3] .85	1.50	1.13	1.50	1.25	1.25	[3] 1.38	1.50	[3] 1.50	[3] 1.25	1.00	[3] 1.50	[3] 1.50	1.25	1.25	1.25	.....	1.25	1.50	1.38	1.63	[3] .95
San Antonio, Tex.	[3] 1.25	1.50	1.50	.50	.50	1.50	.50	1.50	1.50	1.50	1.50	1.50	1.25	1.13	1.25	1.50	1.50	1.25	.....	1.50	†	1.13	1.38	1.13	1.38	.50
San Diego, Calif.	1.25	1.50	1.50	.88	.88	.....	1.00	1.63	1.50	1.50	1.38	1.63	1.80	1.25	1.20	1.50	1.50	1.25	1.25	1.38	1.50	1.50	1.50	1.50	1.50	1.03
San Francisco, Calif.	1.38	1.75	1.60	.88	.88	.....	.....	1.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	.....	.....	.....	.....	.....
Santa Fe, N. M.	1.25	1.50	1.50	.50	.50	1.50	.85	1.50	1.25	1.25	1.25	1.25	1.50	1.00	1.00	1.50	1.25	1.25	1.00	1.25	1.50	1.00	1.00	1.00	1.25	.75
Seattle, Wash.	1.42	1.72	1.62	1.02	1.10	1.72	1.02	1.72	1.47	1.47	1.42	1.62	1.62	1.42	1.37	1.62	1.62	1.42	.....	1.57	1.15	1.75	1.75	1.70	2.00	1.10
Springfield, Ill.	1.50	1.75	1.75	1.00	1.00	1.75	1.15	1.75	1.75	1.35	1.50	1.63	1.60	1.50	1.25	1.70	1.70	1.30	1.30	1.50	†	1.35	1.75	1.50	1.75	.80
Tallahassee, Fla.	1.00	1.50	1.38	.30	.40	.....	.30	1.50	1.50	1.50	1.00	.75	1.25	1.00	1.00	1.50	.....	1.00	1.00	.....	1.50	.40	1.00	.75	1.00	.40
Topeka, Kan.	1.13	1.50	1.25	.60	.60	1.25	.60	1.38	1.25	1.25	1.25	1.25	1.00	1.00	.90	1.25	1.25	1.00	.90	1.25	1.25	1.35	1.35	.90	1.25	.65
Trenton, N. J.	1.63	1.78	2.00	.90	.75	1.78	.90	1.78	1.78	1.78	1.78	1.50	2.00	1.38	1.25	1.75	1.75	1.60	1.60	1.75	†	.....	.....	.....	.....	.75
Tulsa, Okla.	1.25	1.50	1.25	.60	.60	1.50	.80	1.50	1.50	1.50	1.50	1.50	1.50	1.25	1.25	1.50	1.50	1.10	1.50	1.38	†	1.25	1.38	1.25	1.25	.85
Tucson, Ariz.	1.25	1.50	1.50	.83	.90	1.50	.88	1.50	1.50	1.50	1.50	1.38	1.50	1.38	1.15	1.38	1.38	1.25	1.25	1.25	1.13	1.50	1.38	.....	1.63	1.00
Washington, D. C.	1.63	1.75	2.00	.85	.85	1.75	1.00	2.00	1.50	1.50	1.50	1.75	2.00	1.71	1.65	1.75	1.75	1.25	1.25	1.75	†	1.75	2.00	1.25	2.00	.80
Wilmington, Del.	1.50	1.68	1.88	.95	.....	1.70	.95	1.50	1.50	1.50	1.38	1.50	1.60	1.30	1.30	1.60	1.60	1.38	1.38	1.38	1.05	2.00	2.25	1.88	1.88	1.25

† Rate same as trade in connection with which they work. [1] Negotiating new agreement; may increase to $1.75 per hr. [2] Negotiating new agreements; increases expected in April, May or June. [3] Up 12½c. per hr. after June 1. [4] Rates effective April 1. [5] All trades asking increases. [6] Increases to $1.30 May 1. [7] 75c. per square yard.

BEAVER PIPE TOOLS

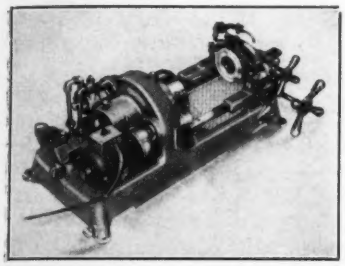
Highest Quality ★ WARREN, OHIO ★ *For* **42** *Years*

The A-B-C of Pipe and Bolt Machines



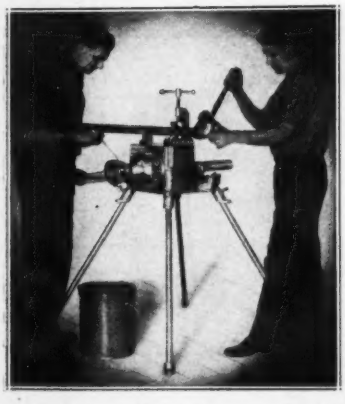
BEAVER MODEL — A

A high-speed heavy-duty deluxe pipe and bolt machine, complete in every detail and admitted leader in its field. Will cut, thread and ream ⅛ to 2-inch pipe and, with drive shaft and geared tools, will cut and thread 2½ to 12-inch pipe. Threads bolts ¼ to 2-inch; cuts off bolts (wheel cutter) up to ⅞-inch. New high speed model outperforms all competition. Right-handed—like a lathe. More than 50% greater open working space. All controls in front. Wheel or knife cutoff. Standard geared chuck with automatic safety wrench ejector. Safety shear pin. Ring-type opening adjustable dieheads—no hinge. Die segments adjust simultaneously as a unit. Choice of 110 or 220 volt universal reversible motor. Automatic gear-driven oil pump. Weight about 415 lbs.



BEAVER MODEL — B

A highly efficient low-priced portable Utility Machine embodying many advanced features heretofore available only on higher priced machines. Complete range ½ to 8-inch pipe; ¼ to 1½-inch bolts. Rack-and-pinion feed; 60% more power; one-piece cast steel-iron base and cap—no flimsy sheet metal housings; sockets for pipe legs to form inexpensive but sturdy stand; all gears run in oil; all-steel geared universal ⅛ to 2-inch chuck—with safety automatic chuck wrench ejector; hinged full-range reamer; sliding wheel or knife cutoff; ring-type opening adjustable dieheads—no hinge. Automatic gear-driven oil pump or one-gallon oil reservoir optional. Adequate motor ventilation. Choice of 110 or 220 volt universal reversible motor. Weight approximately 280 lbs.



BEAVER MODEL — C

Converts pipe tools into electric power tools. It will cut, thread and ream ⅛ to 2-inch pipe. With driveshaft and geared tools 2½ to 8-inch pipe may be cut and threaded. Bolts up to 1½-inch size. Has ample power to allow for dull dies and low line voltage. Choice of 110 or 220 volt universal reversible motor. Now equipped with automatic chuck wrench ejector and safety latch—to protect machine and workman. Equipped with legs, vise and bender, the Beaver Model-C becomes a complete portable electric pipe shop. Hundreds of users, in all parts of the world, say the Beaver Model-C is "the best investment we ever made."

A COMPLETE LINE OF HAND TOOLS

UNIT TYPE RATCHET THREADERS

No. 2 Beaver (Open Ratchet Teeth) Complete

⅛ to ¾" ..... $14.00 — ⅜ to ¾" $9.20
¼ to ¾" ..... 11.60 — ½ to ¾" 6.80
Carrying case for Nos. 2 or 3 Ratchets 1.50

No. 3 Beaver (Enclosed Ratchet Teeth) Complete

⅛ to 1" ..... $18.00 — ⅜ to 1" $13.00
¼ to 1" ..... 15.50 — ¼ to ¾" 13.00
Carrying case for Nos. 2 or 3 Ratchets 1.50

No. 17 Beaver Ratchet Threader Complete

½ to 1¼" ..... $13.50 — ½ to 2" $21.00
1¼ to 2" ..... 12.75 — ⅜ to 2" 29.25

"3-Way" Threaders

No. 33 Beaver ⅜ to ¾" $7.50
No. 34 Beaver ½ to 1" 8.00
No. 34-E Beaver ½ to 1" Conduit 8.00

FULLY ADJUSTABLE PIPE and BOLT THREADERS

Threads ⅛ to ¾" pipe; ¼ to 1" bolts

No. 71 Plain—less dies $4.50
No. 71R Ratchet—less dies 6.50
Pipe or bolt dies, any size, per set RH 1.50
Pipe or bolt dies, any size, per set LH 2.50
Metal Carrying Case 2.50

FULLY ADJUSTABLE SELF-CONTAINED THREADERS TO 2"

No. 6 Beaverette Plain—¼ to ¾" $12.00
No. 6R Beaverette Ratchet—¼ to ¾" 15.00
No. 10R Ratchet—1 to 2" 13.50
No. 25 Beaver Plain DeLuxe—1 to 2" 16.50
No. 26 Beaver Ratchet DeLuxe—1 to 2" 19.25

SEMI-ADJUSTABLE TAPER-POST THREADERS 1 to 2"

No. 7R Beaver Ratchet with Bushings $13.50
No. 9 Beaver Plain DeLuxe (Universal Chuck) 12.00
No. 9R Beaver Ratchet DeLuxe (Universal Chuck) .. 15.00
No. 38RS—(8thd) 2½ & 3" 27.00

LARGE GEARED ADJUSTABLE THREADERS

No. 41E—2½ to 4" .. $ 55.00 — No. 61-E—2½ to 6" . $115.00
No. 61-EX—4 to 6" . 100.00 — No. 80-E—4½ to 8" . 150.00
No. 90—9 to 12" $250.00

GEARED SEMI-ADJUSTABLE THREADERS

No. 48R—2½ to 4" $55.00

WHEEL CUTTERS

No. 102—⅛ to 2" (1 wheel) $4.40
No. 102—⅛ to 2" (3 wheel) 4.80
No. 204—2½ to 4" (3 wheel only) 14.40

SQUARE END KNIFE CUTTERS ⅛ to 12"

For Cutting—Beveling—or Grooving

No. 1—⅛ to 1" .. $13.50 — No. 10—2½ to 4" Ratchet .. $60.00
No. 5—½ to 2" .. 15.00 — No. 15—2½ to 6" Ratchet .. 75.00

Geared Type Hand or Power (Ratchet)

No. 104—2½ to 4" .. $ 75.00 — No. 108—4½ to 8" .. $150.00
No. 106—2½ to 6" ... 120.00 — No. 112—9 to 12" 200.00

BEAVER ALLOY STEEL DROP FORGED REAMERS

No. 200 Swivel—⅛ to 2" $5.00
No. 200R Ratchet—⅛ to 2" 6.00
No. 300R Ratchet—⅜ to 3" 7.00

BEAVER SQUARE-END SAWING VISE

No. 2—⅛ to 2" ..... $6.50 — No. 4—1½ to 4" $15.00

Write for Catalog 42EN

Yearly Average WAGES OF SIX BUILDING TRADES in Seven Cities

Bricklayers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.65	$0.70	$0.75	$0.70	$0.70	$0.875	$0.75
1914	.65	.75	.75	.70	.75	.875	.75
1915	.65	.75	.75	.70	.75	.875	.75
1916	.65	.75	.75	.70	.75	.875	.75
1917	.70	.75	.75	.70	.75	.875	.81
1918	.80	.81	.75	.875	.85	1.00	1.00
1919	.80	.875	.875	.875	1.00	1.125	1.125
1920	1.00	1.25	1.25	1.00	1.25	1.25	1.25
1921	1.00	1.25	1.25	1.00	1.25	1.25	1.125
1922	1.00	1.25	1.10	1.00	1.25	1.25	1.125
1923	1.25	1.50	1.10	1.125	1.50	1.375	1.25
1924	1.25	1.50	1.35	1.125	1.75	1.25	1.25
1925	1.25	1.50	1.50	1.25	1.75	1.25	1.35
1926	1.35	1.645	1.56	1.25	1.75	1.25	1.375
1927	1.40	1.75	1.625	1.25	1.75	1.375	1.375
1928	1.42	1.75	1.625	1.45	1.75	1.375	1.4275
1929	1.50	1.84	1.65	1.50	1.75	1.375	1.50
1930	1.50	1.925	1.70	1.50	1.75	1.375	1.50
1931	1.50	1.7125	1.70	.8125	1.75	1.375	1.1875
1932	1.105	1.47	1.40	.825	1.50	1.175	.975
1933	1.10	1.375	1.406	.812	1.50	1.125	1.01
1934	1.12	1.53	1.50	1.00	1.50	1.50	1.30
1935	1.20	1.50	1.50	1.00	1.50	1.50	1.00
1936	1.28	1.50	1.50	1.00	1.50	1.50	1.00
1937	1.50	1.725	1.62	1.33	1.50	1.60	1.54
1938	1.50	1.886	1.70	1.50	1.50	1.75	1.60
1939	1.50	1.893	1.70	1.50	1.50	1.75	1.60
1940	1.50	1.96	1.70	1.49	1.50	1.75	1.60
1941	1.50	2.00	1.70	1.448	1.396	1.75	1.6375

Hodcarriers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.35	$0.375	$0.40	.....	$0.4875	$0.50	
1914	.35	.375	.40	.....	.4875	.50	
1915	.35	.375	.40	.....	.4875	.50	
1916	.35	.375	.425	.....	.4875	.50	
1917	.40	.425	.45	.....	.4875	.50	
1918	.425	.47	.50	.....	.51	.625	
1919	.50	.575	.575	.....	.6375	.75	
1920	.70	.775	1.00	.....	.70	.93	
1921	.70	.875	1.00	.....	.85	1.00	$0.875
1922	.70	.875	.725	.....	.85	.71	.875
1923	.70	.95	.725	.....	1.00	.77	.95
1924	.82	1.00	.725	$0.385	1.20	.8125	.95
1925	.7625	1.00	.825	.6075	1.20	.8125	1.00
1926	.77	1.07	.88	.625	1.20	.8125	1.00
1927	.79	1.125	.925	.625	1.20	.875	1.00
1928	.805	1.125	.93125	.52	1.20	.875	1.00
1929	.85	1.15	.93	.50	1.20	.875	1.00
1930	.85	1.03125	.975	.50	1.20	.875	1.00
1931	.85	1.025	.975	.35	.875	.875	.70
1932	.70	1.00	.825	.40	1.00	.70	.80
1933	.70	.91	.....	.....	1.00	.70	.80
1934	.70	.825	.825	.....	.875	.70	1.00
1935	.70	.825	.825	.....	.875	.70	1.00
1936	.77	.825	.95	.30–.40	.875	1.00	1.00
1937	.85	1.14	1.025	.40	1.00	1.10	1.15
1938	.85	1.14	1.025	.40	1.00	1.25	1.15
1939	.85	1.14	1.025	.40	1.00	1.25	1.15
1940	.85	1.186	1.025	.40	1.00	1.25	1.15
1941	.85	1.214	1.025	.4583	1.00	1.25	1.015

Carpenters

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.50	$0.625	$0.65	$0.525	$0.625	$0.625	$0.56
1914	.55	.625	.65	.45	.625	.625	.56
1915	.55	.625	.65	.45	.625	.625	.56
1916	.57	.625	.70	.45	.625	.625	.56
1917	.60	.69	.70	.45	.65	.68	.65
1918	.65	.69	.70	.55	.70	.75	.825
1919	.75	.75	.80	.65	.825	.875	.93
1920	1.00	1.125	1.25	.75	1.00	1.06	1.00
1921	1.00	1.125	1.25	.75	1.25	1.125	.875
1922	1.00	1.125	1.10	.75	1.10	1.04	.875
1923	1.05	1.125	1.25	.75	1.25	1.04	1.00
1924	1.05	1.3125	1.17	.76	1.525	1.00	1.00
1925	1.0875	1.3125	1.3475	.6025	1.50	1.00	1.0825
1926	1.20	1.45	1.39	.6575	1.50	1.00	1.125
1927	1.25	1.50	1.30	.95	1.50	1.125	1.125
1928	1.279	1.50	1.50	1.00	1.50	1.125	1.125
1929	1.38	1.55	1.47	1.00	1.50	1.125	1.125
1930	1.375	1.65	1.625	1.00	1.50	1.125	1.125
1931	1.175	1.45	1.625	.60	1.50	1.125	.875
1932	1.04	1.33	1.40	.60	1.275	.96	.695
1933	1.065	1.375	1.3125	.60	1.25	.90	.73
1934	.9375	1.40	1.3125	1.00	1.25	1.05	.83
1935	.9275	1.40	1.3156	1.00	1.25	1.10	1.00
1936	.937	1.40	1.50	.88	1.25	1.12	1.00
1937	1.14	1.60	1.57	1.06	1.35	1.31	1.23
1938	1.343	1.75	1.625	1.125	1.25	1.25	1.25
1939	1.375	1.75	1.625	1.125	1.25	1.25	1.25
1940	1.375	1.81	1.625	1.125	1.333	1.25	1.25
1941	1.24	1.85	1.625	1.099	1.333	1.291	1.325

Plasterers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.65	$0.69	$0.75	.....	$0.75	$0.875	$0.75
1914	.65	.69	.75	— — —	.75	.875	.75
1915	.65	.69	.75	— — —	.75	.875	.75
1916	.70	.75	.75	— — —	.75	.875	.75
1917	.70	.75	.75	— — —	.75	.875	.875
1918	.70	.75	.81	— — —	.875	1.00	1.00
1919	.80	.90	.875	— — —	1.00	1.125	1.125
1920	1.00	1.25	1.25	— — —	1.25	1.25	1.25
1921	1.25	1.25	1.25	— — —	1.375	1.375	1.25
1922	1.125	1.25	1.10	— — —	1.375	1.275	1.125
1923	1.125	1.25	1.50	— — —	1.50	1.275	1.25
1924	1.25	1.50	1.50	— — —	1.75	1.275	1.375
1925	1.25	1.50	1.50	— — —	1.75	1.50	1.375
1926	1.50	1.75	1.50	— — —	1.75	1.50	1.375
1927	1.50	1.75	1.625	— — —	1.75	1.50	1.375
1928	1.50	1.75	1.625	— — —	1.75	1.50	1.50
1929	1.50	1.75	1.625	— — —	1.75	1.375	1.50
1930	1.625	1.925	1.70	.....	1.75	1.375	1.50
1931	1.50	1.7125	1.70	$1.00	1.75	1.375	1.1875
1932	1.625	1.50	1.375	1.25	1.50	1.10	1.20
1933	1.375	1.50	1.375	.....	1.50	1.10	1.20
1934	1.231	1.50	1.50	1.00	1.50	1.38	1.18
1935	1.375	1.50	1.50	1.00	1.50	1.25	1.375
1936	1.375	1.50	1.50	1.00	1.50	1.35	1.25
1937	1.625	1.80	1.62	1.00	1.51	1.51	1.54
1938	1.625	2.00	1.70	1.00	1.58	1.65	1.60
1939	1.625	2.00	1.70	1.00	1.58	1.60	1.60
1940	1.625	2.00	1.70	1.00	1.722	1.60	1.60
1941	1.625	2.00	1.70	1.271	1.75	1.639	1.6375

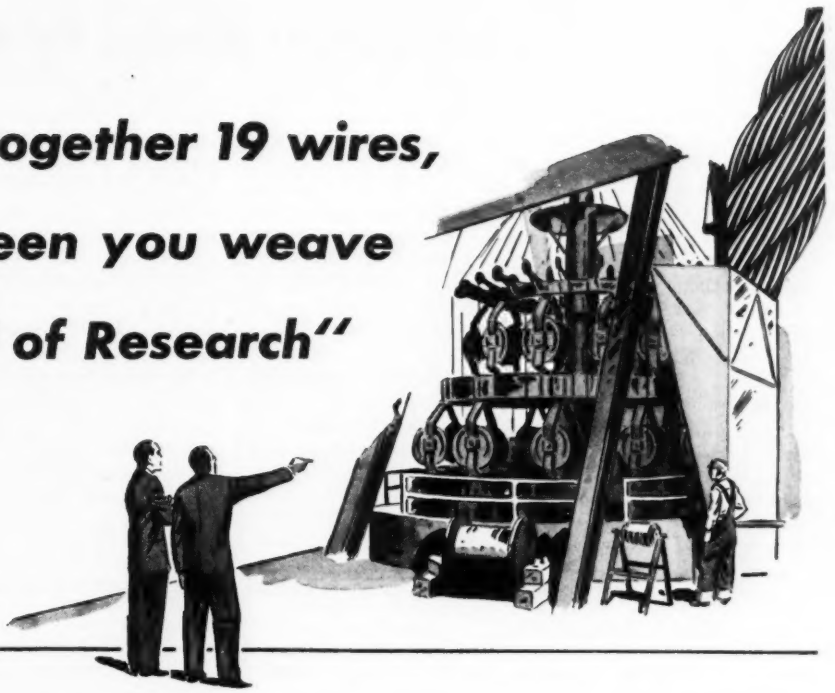
Structural Ironworkers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.625	$0.625	$0.68	$0.625	$0.65	$0.75	$0.625
1914	.625	.625	.68	.625	.65	.75	.625
1915	.625	.625	.68	.625	.65	.75	.625
1916	.625	.66	.68	.625	.675	.75	.625
1917	.68	.68	.69	.625	.70	.75	.75
1918	.80	.80	.70	.75	.80	.875	.875
1919	.80	.875	.875	.80	.925	1.00	1.00
1920	1.00	1.125	1.25	1.00	1.25	1.125	1.125
1921	1.00	1.125	1.25	.....	1.25	1.25	1.125
1922	1.00	1.125	1.05	.....	1.06	1.125	1.00
1923	1.05	1.125	1.05	1.05	1.25	1.125	1.125
1924	1.16	1.29	1.25	1.00	1.45	1.125	1.125
1925	1.1375	1.4675	1.36	1.135	1.50	1.125	1.125
1926	1.23	1.60	1.405	1.25	1.50	1.125	1.125
1927	1.35	1.75	1.50	1.55	1.50	1.375	1.155
1928	1.3125	1.75	1.50	1.75	1.50	1.375	1.215
1929	1.375	1.81	1.57	1.63	1.57	1.375	1.25
1930	1.375	1.925	1.625	1.25	1.75	1.375	1.25
1931	1.375	1.925	1.625	.75	1.75	1.375	1.1875
1932	1.205	1.675	1.375	.75	1.50	1.13	1.13
1933	1.14	1.65	1.35	.75	1.47	1.20	1.10
1934	1.20	1.62	1.35	1.00	1.47	1.375	1.13
1935	1.20	1.65	1.35	1.125	1.47	1.375	1.23
1936	1.20	1.58	1.50	1.10	1.47	1.375	1.25
1937	1.375	1.79	1.58	1.25	1.73	1.44	1.39
1938	1.479	1.925	1.70	1.25	1.75	1.50	1.50
1939	1.60	1.925	1.70	1.25	1.75	1.50	1.50
1940	1.5625	1.9625	1.70	1.302	1.75	1.60	1.50
1941	1.50	2.00	1.70	1.469	1.75	1.60	1.5375

Common Laborers

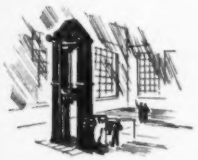
	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.35	$0.225	$0.40	.....	$0.25	$0.27	$0.375
1914	.35	.225	.40	.....	.25	.31	.375
1915	.35	.25	.40	— — —	.25	.31	.375
1916	.35	.25	.425	— — —	.25	.31	.375
1917	.375	.30	.45	— — —	.30	.375	.4375
1918	.40	.405	.50	— — —	.365	.43	.56
1919	.40	.405	.575	— — —	.425	.625	.6875
1920	.6875	.75	1.00	.....	.6075	.75	.75
1921	.6875	.60	1.00	.....	.6075	.81	.75
1922	.6875	.60	.725	.....	.5575	.625	.625
1923	.6875	.615	.725	.....	.6075	.625	.625
1924	.6625	.6875	.8175	$0.335	.70	.525	.625
1925	.6025	.6525	.8175	.31	.6525	.525	.5625
1926	.615	.815	.86	.30	.6525	.525	.5675
1927	.595	.90625	.8875	.325	.5875	.55	.64
1928	.6025	.90625	.90	.325	.60	.55	.678
1929	.625	.985	.92	.29	.61	.57	.70
1930	.625	1.03125	.975	.275	.6375	.6875	.70
1931	.60	.65625	.7375	.20	.6125	.59375	.60
1932	.575	.645	.665	.225	.56	.56	.485
1933	.548	.725	.784	.248	.6223	.64	.48
1934	.55	.8475	.825	.30	.7875	.64	.53
1935	.575	.68	.825	.30	.7875	.625	.60
1936	.581	.65	.95	.35	.7875	.651	.60
1937	.725	.91	.99	.35	.86	.75	.87
1938	.735	.912	1.025	.35	.663	.65	1.00
1939	.725	.912	1.025	.35	.663	.65	.908
1940	.725	.912	1.025	.35	.804	.745	.90
1941	.7875	.934	1.025	.4167	.875	.842	.975

"You strand together 19 wires, and in between you weave the thread of Research"



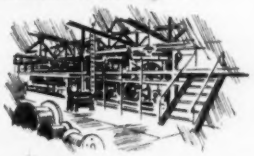
Like the research that's responsible for this giant strander

"Many a job calls for 6 x 19 "Blue Center" Steel Wire Rope, but for those that don't, Roebling Research is ready with specialized facilities and materials. This giant strander, for example, can take as many as 46 tough steel wires, and accurately lay them into strand for pliable, high-strength, large diameter ropes, such as are used on mammoth dredges . . .



How strong is such a strand? If we want to know, this "tower of torture" will tell us. Another of the long arms of Roebling Research, it can pull apart a 4" wire rope to find its ultimate breaking strength. It also indicates how the rope will behave under *your* conditions and *your* loads . . .

But of course you know that a study of wire rope quality must cover more than breaking strength alone. That is why Roebling Research created the world's largest, most highly developed fatigue testing machine for wire rope—a giant laboratory in itself. In its 75-foot length it simulates many conditions that "Blue Center" Steel Wire Rope meets in the field, lets Roebling Research men study each condition carefully . . .



Thus the strong but invisible thread of Research is woven into every inch of Roebling "Blue Center" Steel Wire Rope. Giving it the extra stamina to meet the unusual load as well as the routine one . . . to give extra service where extra service is called for. Bringing it to the high standards it must pass, to carry the Roebling Trademark . . ."

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Roebling Research, Roebling Engineering, Roebling Plant Facilities and broad Experience . . . each adds its part to the extra values in Roebling "Blue Center" Rope. Each helps it meet conditions unfailingly, wherever wire rope has a routine or unusual job to do.

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THAT'S THE ONLY WAY TO MAKE

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"Blue Center"

STEEL WIRE ROPE

PREFORMED OR NON-PREFORMED

Equipment Rental Rates

RENTAL RATES for construction machinery are less stable this year than formerly and as we go to press the Office of Price Administration is preparing a "ceiling" on equipment rental expected to be at about the rates in the Associated Equipment Distributors' "Green Book" Compilation of Rental Rates for Construction Equipment. This schedule was prepared in 1940-1941 as an average of rental rates then existing throughout the United States and was offered, as stated in the foreword. ". . . as a guide to those engaged in the construction industry, and not an effort to fix rental rates in any section of the country."

Prior to official discussions on establishing a ceiling on rental rate schedules, individual members of the A.E.D. were generally adhering to the Green Book schedule as a maximum, absorbing increased labor and repair costs as a patriotic contribution and a step in avoiding inflation. Perhaps naturally, due to a rather general shortage of first class rental equipment, some dealers have asked more for equipment this year than a year ago though rates on some items, especially on the West Coast, are below Green Book rates.

Throughout the country good equipment is generally scarce, the recapture provision of early government contracts having taken the equipment into government ownership where it is no longer available through the usual rental channels. Only about 15 percent of the output of the equipment manufacturers now reaches contractors or rental distributors, the rest going to equip army and navy combat units or to lend-lease.

As this is written there are delays in getting the heavy construction equipment needed even for priority projects though those having idle machines are generally willing to make them available. Both the East and the West Coast report increasing current demands and shortages of heavy equipment with light machines generally available.

Sample Monthly Equipment Rental Rates Taken from the A.E.D. Guide

Machine	Monthly Rental
Air compressors	
Portable, gasoline 105 ft	$150
Portable, gasoline 210 ft	300
Portable, gasoline 315 ft	400
Portable, diesel 210 ft	350
Portable, diesel 315 ft	460
Stationary electric drive, 210 ft	140
Stationary electric drive, 520 ft	280
Air tools	
Hoists, 1,000 lb. single drum	55
Hoists, 2,000 lb. double drum	90
Jackhammer or paving breaker	35
Riveting hammers	25
Wagon drills	175
Batchers — weighing	
For weighing two materials	80
For weighing three materials	100
Boilers	
Vertical, 20 to 30 hp	75
Vertical, 60 to 75 hp	125
Horizontal, 50 to 60 hp	105
Horizontal, 80 to 100 hp	150
Buckets	
Concrete bottom dump, 1 yd	30
Concrete bottom dump, 2 yd	50
Concrete tipover type, 1 yd	20
Clamshell, ¾ yd	95
Clamshell, 1½ yd	140
Dragline, 1 yd	85
Dragline, 1½ yd	110
Orange peel, 1 yd	150
Carts, concrete	
6 cu. ft. rubber tired	12
9 cu. ft. rubber tired	15
Cranes	
Gas crawler, ½ yd	350
Gas crawler, ¾ yd	500
Gas crawler, 1 yd	600
Gas crawler, 2 yd	1,400
Diesel crawler, ¾ yd	600
Diesel crawler, 1 yd	700
Diesel crawler, 2 yd	1,700
Locomotive, steam 22–25 ton	700
Gas driven 10-ton truck crane, per hour	15
Engines	
Gasoline, with clutch, 25 hp	50
Gasoline, with clutch, 60 hp	80
Diesel, with clutch and starter, 25 hp	75
Diesel, with clutch and starter, 60 hp	135
Diesel, with clutch and starter, 100 hp	245
Finishing machines — road	
15–20 ft. roadway width	350
24–30 ft. roadway width	375
Generator sets, complete — a. c. or d. c.	
1 kw. gas engine driven	40
5 kw. gas engine driven	90
10 kw. gas engine driven	150
Hammers	
McKiernan-Terry #2	70
Union #2, McK-T #7	135
Vulcan #1	175
Union #1, McK-T #9B2	175
Vulcan Pile Extractor #400	140

Machine	Monthly Rental
Hoists	
Gas, double drum, 20 hp	80
Gas, double drum, 60 hp	175
Chain, hand powered, 5 ton	30
Electric double drum, 20 hp	90
Electric double drum, 50 hp	156
Mixers	
Power loader, 7-S	85
Power loader, 14-S	155
Batch hopper, 28-S	210
Paver, 27-E, new type	750
Unmounted truck mixer, 2½ c.y.	300
Unmounted truck mixer, 4 c.y.	400
Pumps	
Triplex, 35–40 hp	125
Gas centrifugal, 2 in	40
Gas centrifugal, 4 in	80
Hand diaphragm, 4 in	8
Power, open top double diaphragm, 4 in	65
Well-point 8 in	220
Rollers	
Gas, tandem, 5–8 ton	200
Gas, tandem, 8–12 ton	250
Gas, 3 wheel, 8 ton	270
Gas, 3 wheel, 12 ton	425
Sheepsfoot double drum	90
Sheepsfoot triple drum	175
Shovels	
Gas crawler, ½ yd	400
Gas crawler, ¾ yd	550
Gas crawler, 1¼ yd	800
Diesel crawler, ¾ yd	650
Diesel crawler, 1¼ yd	950
Tractors, crawler	
30 hp. gasoline	255
75 hp. gasoline	425
50 hp. diesel	350
75 hp. diesel	675
100 hp. diesel	800
Bulldozer for 75 hp	145
Angledozer for 75 hp	175
Scrapers	
Single bowl, 4 yd	225
Single bowl, 8 yd	325
Single bowl, 16 yd	650
Double bowl, 12 yd	525
Double bowl, 20 yd	800
Vibrators	
1 hp. gas-engine driven, flexible shaft	40
3 hp. gas-engine driven, flexible shaft	60
Welding machines	
200 amp. gasoline engine driven	85
400 amp. gasoline engine driven	116

All rates are for equipment in good operating condition for one shift. A.E.D. recommends a 50 percent increase for two-shift operation and 100 percent increase in rates for three shifts. The A.E.D. compilation of Rental Rates for Construction Equipment may be obtained from their offices, National Press Building, Washington, for $1.

PUMPS, the BEST COSTS YOU the LEAST

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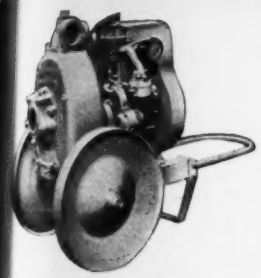
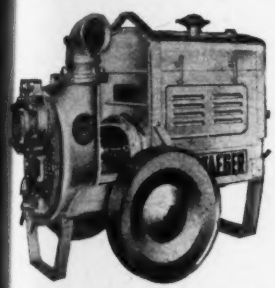
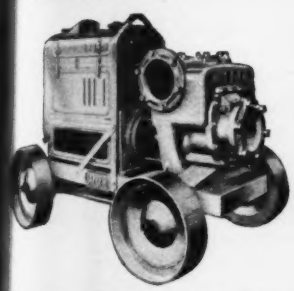


" AND 3" HEAVY DUTY PUMPS: est engineered small pumps — nd high pressures, continuous avy service.



" AND 6" PORTABLE PUMPS: ig capacity (up to 90,000 G.P.H.) nd years of service in compact, sy handling units.

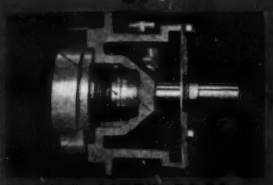


" AND 10" BIG CAPACITY UMPS: Huge air and water apacity (125,000 to over 200,000 .P.H.), plus unequalled compact- ess and portability.

7 Reasons Why Jaegers Outlast and Outperform Other Pumps:

1. HIGH PRESSURE SHELL of pat'd self-cleaning design.
2. REPLACEABLE LINERS.
3. PAT'D PRIMING JET, gives up to 5 times faster sure-priming.

4. HI-HEAD, HI-CAPACITY IMPELLERS (of steel in 4" to 8" sizes).
5. OVER-SIZE SHAFTS of heat-treated chrome nickel.
6. "LONG-LIFE" SEAL — accessible for inspection.



7. DIRECT DRIVE ALWAYS IN ALIGNMENT — adds life to pump and engine.

JAEGER

"SURE-PRIME" PUMPS - - MIXERS - - HOISTS

Manufactured by

THE JAEGER MACHINE COMPANY

200 DUBLIN AVENUE, COLUMBUS, OHIO

MECHANIZED PAVING GETS HIGH PRODUCTION GIVES LOW JOB COSTS

A NECESSITY with Dual-Drum Pavers, an ADVANTAGE with Pavers Big or Small: Jaeger's combination of Spreader with Finisher has eliminated the bottleneck and segregation of hand shoveling. Vital roads and airports are being paved as fast as contractors can pour with biggest dual drum or multiple pavers — mixes as dry as ½" slump, in all standard widths.

NO SEGREGATION with Jaeger Screw Spreader — Remixes and Can VIBRATE — Any Slump to ½", Any Standard Width to 25 Ft.

Only proven method that positively reworks and densifies concrete — improves slab texture — 25 used on Pennsylvania Turnpike. One man spreads and strikes off base and top, saves cost of crew.

LESS WORK TO DO Behind the Jaeger Type "H" Finisher — Flexible Control of Traction and Independent Screeds Increases Capacity and Smoothness

With complete range of effective speeds, "velvet touch" screeding and every function controlled by single direct movement of banked levers, Jaeger-Lakewood Standard or Vibratory Finishers achieve maximum production, cut final finishing costs.

Send for Complete Catalog and Data

THE JAEGER MACHINE COMPANY

200 Dublin Ave., Columbus, Ohio

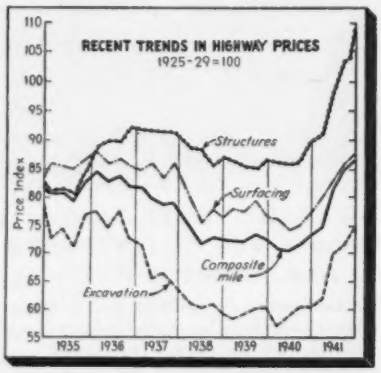
Concrete-Bituminous Paving Equipment, Mixers, Pumps, Hoists, Towers, Truck Mixers

Roadbuilding Costs

THE PRICE TREND in highway construction for a composite standard mile rose steadily throughout 1941, and reached the highest yearly average attained since 1936 according to the Public Roads Administration. The PRA index is based on average prices for the 1925-1929 period for a composite mile of road. In the index are included excavation, surfacing and structures. For comparative purposes, the quantities are considered as unvarying, but in actual practice, the quantities are constantly increasing.

Higher costs prevailed in all of the classes of work that make up the composite mile index. Excavation bid price average climbed from 21c. per cubic yard in the fourth quarter of 1940 to 26c. at the end of 1941; surfacing costs rose from $1.72 per square yard at the 1940 year-end to $1.96 in the final quarter last year. All divisions of the structures index increased. Reinforcing steel bid price jumped from 4.6c. per pound in 1940 to 6c. in 1941; structural steel from 6.6c. per pound to 8.2c.; and structural concrete from $19.79 per cubic yard in the final quarter of 1940 to $22.32 at the end of the succeeding year.

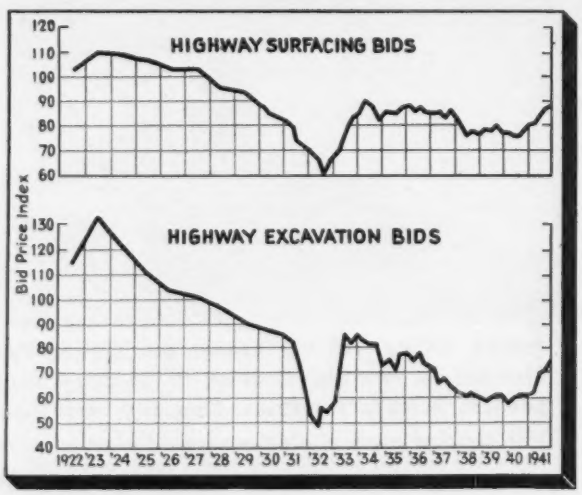
Quarterly data on these prices and base quantities required for the construction of the composite standard mile are given in the accompanying table, and in the charts below.

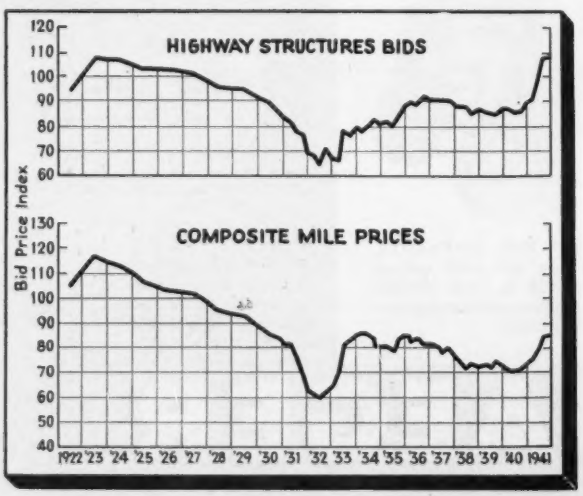


Price Trend in Highway Construction for Composite Standard Mile

Year	Excavation[1] (17,491* cubic yards)		Surfacing[2] (3,726* square yards)		Structures				Composite mile
					Reinforcing steel (16,800* pounds)	Structural steel (4,325* pounds)	Structural concrete (68* cubic yards)	Combined	
	Bid price[3]	Sub-index	Bid price[3]	Sub-index	Bid price[3]	Bid price[3]	Bid price[3]	Sub-index	Index
Base period, 1925 to 1929..	$0.35†	100.0	$2.22†	100.0	$0.052†	$0.067†	$22.15†	100.0	100.0
1922	.40	114.5	2.28	102.7	.050	.074	20.18	95.1	105.8
1923	.47	133.3	2.43	109.5	.057	.078	23.37	108.6	117.9
1924	.43	122.2	2.40	108.3	.057	.077	22.91	107.2	113.1
1925	.39	110.0	2.36	106.4	.056	.067	22.53	103.9	107.3
1926	.36	103.7	2.29	103.1	.053	.074	22.76	103.7	103.4
1927	.35	100.3	2.29	103.3	.051	.071	22.65	101.5	101.9
1928	.34	96.0	2.10	94.5	.049	.067	21.22	96.1	95.3
1929	.32	90.0	2.05	92.7	.048	.059	21.58	95.0	92.1
1930	.30	86.3	1.86	84.1	.045	.061	20.08	89.4	85.7
1931	.27	77.2	1.68	75.6	.040	.054	18.02	79.9	76.8
1932	.18	52.3	1.45	65.2	.034	.048	15.32	68.0	61.0
1933	.26	73.6	1.67	75.1	.037	.046	16.15	72.1	74.1
1934	.29	82.8	1.91	86.0	.043	.053	17.73	80.8	84.0
1935	.26	73.7	1.90	85.5	.044	.052	17.78	81.5	80.6
1936									
1st Q	.27	77.2	1.94	87.7	.044	.056	20.20	88.7	84.1
2nd Q	.26	74.4	1.90	85.8	.046	.059	20.06	89.7	82.3
3rd Q	.27	77.2	1.91	86.3	.046	.061	19.87	89.5	83.5
4th Q	.25	72.7	1.89	85.3	.046	.062	20.87	92.0	81.8
1937									
1st Q	.25	71.2	1.88	84.8	.047	.063	20.31	91.7	81.0
2nd Q	.23	65.5	1.90	85.8	.049	.067	19.42	91.3	79.3
3rd Q	.23	66.1	1.85	83.4	.049	.067	19.42	91.5	78.4
4th Q	.22	63.8	1.91	85.9	.048	.065	19.90	91.3	78.8
1938									
1st Q	.21	61.8	1.77	79.8	.046	.065	19.13	88.6	74.4
2nd Q	.21	60.1	1.67	75.2	.046	.064	19.10	88.2	71.8
3rd Q	.21	60.7	1.73	77.8	.044	.061	18.73	85.4	72.8
4th Q	.21	59.8	1.70	76.7	.044	.060	19.29	86.7	72.2
1939									
1st Q	.21	58.7	1.73	78.0	.043	.058	19.46	86.4	72.3
2nd Q	.21	59.3	1.72	77.4	.043	.059	19.03	85.4	72.1
3rd Q	.21	60.1	1.76	79.4	.043	.060	18.95	85.1	73.3
4th Q	.21	60.4	1.71	76.9	.045	.060	19.07	86.8	72.5
1940									
1st Q	.20	57.0	1.69	76.4	.045	.061	18.88	86.2	70.9
2nd Q	.21	58.7	1.65	74.6	.043	.061	19.07	85.9	70.6
3rd Q	.21	60.4	1.67	75.3	.044	.064	18.95	86.3	71.6
4th Q	.21	60.4	1.72	77.7	.046	.066	19.79	90.0	73.3
1941									
1st Q	.22	62.4	1.78	80.4	.047	.066	19.99	91.3	75.6
2nd Q	.24	69.5	1.86	83.8	.051	.075	20.88	97.6	80.8
3rd Q	.25	71.2	1.94	87.5	.057	.080	22.56	106.4	84.5
4th Q	.26	74.4	1.96	88.6	.060	.082	22.32	107.8	86.4

[1] Common excavation plus other excavation items expressed as equivalent common excavation.
[2] Portland-cement concrete plus other surfacing items expressed as equivalent portland-cement concrete.
[3] Indexes and totals were calculated with the bid prices carried to 1 more decimal place than that to which they are shown in this table.
Column showing amount of bid price times fixed quantity omitted in this table.
* Fixed quantities used for establishing composite mile for price trend.
† Fixed prices used for establishing composite mile index base.





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Keep the job moving with

BLAW-KNOX CONSTRUCTION EQUIPMENT

The trouble-free equipment that Blaw-Knox makes is keeping vital construction jobs going at full speed . . . saving valuable days, weeks and months in the completion of projects necessary for victory.

Every day, construction records are being broken, and Blaw-Knox Construction Equipment helps contractors to do their part.

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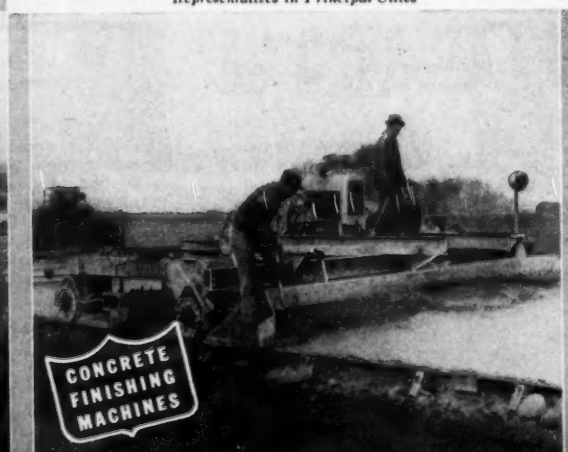
Representatives in Principal Cities



Municipal Building Costs—New York City

The various types of buildings listed were designed, constructed and completed during 1941 under the supervision of the Department of Public Works, New York, N. Y., Irving V. A. Huie, Commissioner, and Homer R. Seely, Deputy and Acting Commissioner.

Hospital Buildings

PSYCHIATRIC PAVILION—Building is double "Y" plan. Stem is seven stories in height, penthouse and basement, 156x43-ft. Each of four wings is six stories and basement in height, two of which are 90x36-ft., and two 73x36-ft. At the middle of the stem there is a 3-story and basement wing 78x70-ft. Fireproof construction. Steel frame, cinder arches, terra cotta partitions and furring, brick backing on face brick and limestone trim on the exterior. Building is unusually well-equipped with nursing and dietary aids, diagnostic and therapeutic facilities, recreation and administrative suites. Contains one of the largest mental hygiene clinics in existance for outpatients. Capacity: 385 beds. Cost per bed: $4,500.00.

Cubic foot cost $0.98

TUBERCULOSIS PAVILION—Tee-shaped fireproof building. Main element 360x48-ft.; three stories, penthouse and basement. Wing is 81x51-ft., one-story and basement. Steel frame with Republic System floor arches. Exterior walls common brick, limestone trim, backed with terra cotta blocks. Capacity: 152 beds. Construction cost per bed is $6,865.00. The building, while housing 152 beds, contains diagnostic, therapeutic and administrative facilities for entire hospital which has 332 beds in other buildings.

Cubic foot cost $0.61
Square foot cost $13.00

KITCHEN BUILDING — Approximately two-thirds of building is of double-story height with no intervening floor structure and balance is of regular two-story construction. Dimensions 108x84-ft. Fireproof steel-frame construction, solid brick walls with facebrick, limestone trim exterior. Walls have large areas of steel-pivoted windows. Kitchen serves about 1,700 patients in adjacent hospital buildings. Cost includes pedestrian and pipe tunnels to other buildings.

Cubic foot cost $0.70
Square foot cost $36.00

OUTPATIENT BUILDING — Five-story and basement hospital building; fireproof construction; skeleton steel frame; dimensions 152x65-ft. Steel sash throughout. Hollow tile partitions and furring, and movable metal partitions. Contains laboratory, sterilizing and kitchen equipment. Floor is of cinder concrete arches with terrazzo, asphalt tile and rubber tile finish. Spread footings and steel pile foundations.

Cubic foot cost $0.86
Square foot cost $13.20

Public Market Buildings

RETAIL MARKET — One-story and basement, with mezzanine. Tee-shaped in plan, 174-ft. deep, with two street fronts of 50 and 100-ft., respectively. Steel frame, brick walls and wood pile foundations. Capacity: 120 stands.

Cubic foot cost $0.27
Square foot cost $8.76

RETAIL MARKET—One-story and cellar, ell-shaped fireproof structure accommodating 150 stands. Skeleton steel frame, cinder concrete roof. Framing enclosed in face brick on street elevation. Foundations of the spread-footing type.

Cubic foot cost $0.27
Square foot cost $8.92

RETAIL MARKET—One-story and cellar in height. Skeleton steel frame; gypsum plank roof; exterior brick walls; interior unglazed facing tile. Steel sash, glass block roof lights. Foundations are spread footings. Capacity: 130 stands.

Cubic foot cost $0.32
Square foot cost $10.70

RETAIL MARKET — One-story and cellar. Construction is of skeleton steel frame; brick and tile walls with steel sash; large show windows permitting unobstructed view of interior. Capacity: 150 stands. Steel pile foundations.

Cubic foot cost $0.35
Square foot cost $12.07

Library Building

LIBRARY ADDITION—Three-story and basement, connected to existing library building. Exterior walls are brick and limestone trim; fireproof steel-frame construction. Approximately 100x66-ft.; spread-footing foundations.

Cubic foot cost $0.49
Square foot cost $9.50

Fire House

FIREBOAT HOUSE — Building is two-story, brick, with hose-tower. Dimensions: main building 30x57x29; high tower, 11x12-ft., 20-ft. above roof. Building exposed on all four sides, finished with face brick, stone coping and trim around all door and window openings, except large entrance door which is of brick design. Structural glass blocks are also included at the hose tower and stair well. Construction is wall-bearing steel with reinforced concrete floor and roof slab. Exterior windows throughout are of wood construction, double hung. Roofing is of tar, felt, and slag. Wood pile foundations.

Cubic foot cost $1.04
Square foot cost $17.50

NOTE: Construction cost per cubic foot includes excavation, foundations, general construction, plumbing, heating and ventilating, electrical work, lighting fixtures, elevators and built-in equipment. Items excluded are furniture, architects and engineering fees, and land costs.

Square foot costs are approximate and based on the total floor area.

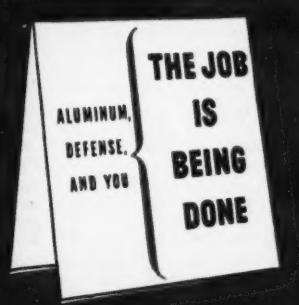
FORGET YOUR OLD ASSUMPTIONS

IMAGINEERING

IMAGINEERING

IMAGINEERING

IMAGINEERING



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IN THESE DAYS an advertisement is no place either for hosannas or sermons about production. Every man knows how well he is doing the job that is before him. Deeds, not words, are the measure.

BUT WORDS CAN BECKON beyond the realms of immediate duty.

IMAGINEERING is such a word. We coined it to make the needs of the future a reality, here and now. It is a way of describing what a man can do about the day when. . .

HOW DO YOU DO IT? You let your imagination soar and then engineer it down to earth. You think about the things you used to make, and decide that if you don't find out some way to make them immeasurably better you may never be asked by your customers to make them again.

YOU FORGET YOUR OLD ASSUMPTIONS. For instance, you may be one who used to assume that aluminum was too expensive. Even if you were right then (and you may not have been) the price trend of aluminum knocks those assumptions into a cocked hat.

WERE YOU ONE who used to assume that structures behaved exactly the way the theory said? Have you looked into the new answers the mammoth testing machine in the Aluminum Research Laboratory has found for that one?

DID YOUR OLD PRODUCT GROW like Topsy? More than one designer is Imagineering with this point of view: My product was in a groove. I couldn't get it out, because I didn't dare get too far away from last year's model. Now's my chance to start from scratch, and let tradition be hanged.

THAT IS THE KIND OF THINKING that will make jobs in the future. It is the kind we can help with: help with ideas and with know-how. Will you invite us?

Aluminum Company of America, 2108 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

Small House Costs

THE CUBIC-FOOT COST of building the same standard house in 80 representative U. S. cities is computed by the Federal Home Loan Bank Board. The cities reporting are divided into 3 groups or cycles, of which one cycle is given each month. Thus, the costs in each city are available four times a year.

In determining the cubic content of the house, length and width are taken as the actual measurement of the outside walls. Height is the distance from 6 inches below the finished surface of cellar floor to a point halfway between roof ridge and attic floor beams. Multiplying these factors gives the gross cube.

The house on which costs are reported is a detached 6-room home of 24,000-cu.ft. volume. Living room, dining room, kitchen and lavatory on first floor; 3 bedrooms and bath on second floor. Exterior is wide-board siding with brick and stucco as features of design. Best quality materials and workmanship are used.

The house is not completed ready for occupancy. It includes all fundamental structural elements, an attached 1-car garage, an unfinished cellar, an unfinished attic, a fireplace, essential heating, plumbing and electric wiring equipment, and complete insulation. It does not include wall-paper nor other wall or ceiling finish on interior plastered surface, lighting fixtures, refrigerators, water heaters, ranges, screens, weather stripping, nor window shades.

Reported costs include, in addition to material and labor costs, compensation insurance, an allowance for contractor's overhead and transportation of materials, plus 10 per cent for builder's profit.

Reported costs do not include the cost of land nor of surveying the land, the cost of planting the lot, nor of providing walks and driveways; they do not include architect's fee, cost of building permit, financing charges, nor sales costs.

In figuring costs, current prices on the same building materials list are obtained every three months from the same dealers, and current wages are obtained from the same reputable contractors and builders.

Small House Costs—Cents Per Cubic Foot

Federal Home Loan Bank Board

	1939				1940				1941				1942
	JAN.	APR.	JULY	OCT.	JAN.	APR.	JULY	OCT.	JAN.	APR.	JULY	OCT.	JAN.
Albany, N. Y.	228	233	230	233	234	237	235	236	257	274	276	281	286
Atlantic City, N. J.	241	239	244	261	261	253	249	257	294	299	299	302	304
Boise, Idaho	253	257	257	255	259	261	261	268	274	274	279	276	284
Buffalo, N. Y.	240	236	234	246	237	238	238	239	256	264	276	286	291
Camden, N. J.	233	237	232	243	248	248	248	261	267	268	283	323	322
Casper, Wyo.	269	272	272	275	268	261	251	251	269	265	266	269	274
Des Moines, Iowa	262	261	262	263	264	264	265	267	267	266	259	271	278
Detroit, Mich.	258	255	255	247	242	243	243	251	258	257	270	284	287
Duluth, Minn.	249	250	250	252	258	258	257	257	257	257	260	270	273
Evansville, Ind.	244	240	246	254	255	255	255	263	271	270	272	285	302
Fargo, N. D.	236	236	234	243	244	244	240	242	246	245	242	257	258
Grand Rapids, Mich.	246	243	243	236	229	230	236	245	267	258	272	298	306
Great Falls, Mont.	291	293	289	287	290	288	287	287	298	304	304	315	316
Indianapolis, Ind.	243	249	248	239	233	229	229	231	266	267	266	275	285
Kansas City, Mo.	242	248	255	248	251	250	245	242	260	259	260	272	278
Newark, N. J.	231	231	229	236	238	238	238	239	252	256	292	303	304
Portland, Ore.	221	212	214	217	218	217	217	220	217	220	221	237	238
St. Louis, Mo.	231	230	226	230	234	232	232	233	238	239	243	250	248
St. Paul, Minn.	272	274	273	273	272	271	270	271	275	275	277	284	289
Salt Lake City, Utah	245	251	251	250	251	251	250	254	265	267	284	294	298
Seattle, Wash.	261	263	261	263	263	265	264	269	286	290	300	306	312
Sioux Falls, S. D.	261	259	251	252	254	257	257	258	254	259	260	276	279
South Bend, Ind.	226	229	231	244	242	246	246	253	271	270	277	283	302
Spokane, Wash.	250	254	255	262	263	263	263	265	287	286	289	299	299
Utica, N. Y.	239	247	238	241	243	.....	249	251	256	269	306	303	311
White Plains, N. Y.	231	229	226	231	233	233	226	233	263	266	273	288	290

	1939				1940				1941				1942
	FEB.	MAY	AUG.	NOV.	FEB.	MAY	AUG.	NOV.	FEB.	MAY	AUG.	NOV.	FEB.
Albuquerque, N. M.	272	267	267	263	261	259	261	282	291	292	297	325	....
Charleston, W. Va.	244	244	242	243	243	244	242	248	256	262	260	272	275
Cincinnati, Ohio	229	230	229	232	230	230	232	239	239	237	246	264	265
Cleveland, Ohio	268	270	270	285	283	279	287	290	287	299	302	309	312
Columbus, Ohio	237	235	234	241	242	242	240	246	249	256	265	275	276
Dallas, Tex.	235	228	226	222	226	226	226	251	276	280	284	314	320
Harrisburg, Pa.	238	238	239	254	245	245	247	273	281	281	294	318	325
Houston, Tex.	246	246	245	244	247	246	237	271	276	279	284	313	323
Jackson, Miss.	251	246	246	251	251	254	254	247	253	258	264	264	267
Lexington, Ky.	236	235	238	246	246	236	232	228	231	236	247	254	261
Little Rock, Ark.	216	218	218	216	216	215	214	217	216	216	221	221	221
Los Angeles, Cal.	225	220	218	221	219	219	219	229	230	232	242	251	260
Louisville, Ky.	218	219	218	225	225	227	226	227	262	276	279	294	301
Memphis, Tenn.	227	222	220	226	225	225	223	230	253	250	257	263	271
Nashville, Tenn.	212	208	206	209	207	206	203	221	231	238	244	253	258
New Orelans, La.	237	235	235	244	243	240	238	251	253	259	265	265	269
Philadelphia, Pa.	225	226	229	233	233	236	242	263	263	263	275	299	306
Phoenix, Ariz.	257	252	255	259	258	258	258	276	281	283	296	308	310
Pittsburgh, Pa.	269	267	268	267	261	256	256	268	282	286	304	304	301
Reno, Nev.	274	273	274	279	281	282	282	281	292	298	299	319	321
San Antonio, Tex.	245	245	244	237	233	229	228	243	274	274	279	317	320
San Diego, Cal.	241	238	234	228	226	221	222	254	253	254	266	290	292
San Francisco, Cal.	266	265	263	263	263	262	260	265	265	271	288	293	305
Wheeling, W. Va.	258	262	263	264	263	264	253	272	268	275	277	289	294
Wilmington, Del.	240	233	226	225	225	218	217	249	251	258	276	293	312

	1939				1940				1941				1942
	MAR.	JUNE	SEPT.	DEC.	MAR.	JUNE	SEPT.	DEC.	MAR.	JUNE	SEPT.	DEC.	MAR.
Asheville, N. C.	212	203	202	213	208	207	206	222	240	238	241	247	....
Atlanta, Ga.	203	201	200	205	205	203	203	229	242	247	256	258	....
Baltimore, Md.	195	198	196	200	198	198	205	236	254	257	257	262	....
Birmingham, Ala.	236	221	215	216	217	211	222	254	266	271	289	292	....
Boston, Mass.	266	262	264	268	270	270	270	278	282	291	297	306	....
Chicago, Ill.	285	285	282	283	283	282	285	288	296	307	324	328	....
Columbia, S. C.	202	199	197	195	197	194	195	227	231	239	245	252	....
Cumberland, Md.	230	231	228	228	235	....	....	243	252	250	261	262	....
Denver, Colo.	265	266	262	259	259	254	255	264	271	269	281	284	....
Hartford, Conn.	244	243	243	246	247	251	245	258	268	276	299	300	....
Manchester, N. H.	229	226	222	224	225	225	226	240	242	245	245	249	....
Milwaukee, Wis.	220	221	219	223	223	224	230	245	249	255	271	276	....
New Haven, Conn.	235	233	236	241	244	245	245	255	262	277	297	299	....
Oklahoma City, Okla.	245	244	246	250	252	255	254	266	275	273	295	324	....
Omaha, Neb.	241	241	248	253	257	256	246	249	256	262	261	262	....
Oshkosh, Wis.	227	229	229	225	229	226	226	242	249	251	268	273	....
Peoria, Ill.	268	273	277	288	293	295	296	298	303	304	320	321	....
Portland, Me.	219	221	219	218	219	219	220	220	224	226	226	229	....
Providence, R. I.	247	250	248	250	251	253	255	259	262	265	273	279	....
Raleigh, N. C.	219	206	202	216	209	209	217	223	228	229	254	256	....
Richmond, Va.	212	206	208	206	202	201	206	226	232	233	248	247	....
Roanoke, Va.	214	215	215	216	217	217	....	238	251	247	251	257	....
Rutland, Vt.	228	226	223	220	222	222	226	227	245	247	263	265	....
Salisbury, N. C.	197	195	194	203	203	203	189	187	196	215	209	211	....
Springfield, Ill.	284	283	282	295	295	298	299	309	311	311	327	328	....
Tampa, Fla.	231	232	232	238	239	236	238	251	256	256	258	260	....
Washington, D. C.	242	236	239	239	239	239	246	267	260	257	257	267	....
West Palm Beach, Fla.	241	241	238	239	243	252	256	280	273	266	278	283	....
Wichita, Kan.	254	251	250	241	240	243	....	238	241	252	255	266	....

Here's a 48 to 60 hour week —by working 40 hours!

Everybody says our greatest shortage in the war program is TIME. Here's how to get the welding output of 48 to 60 hours with no more effort and no more time than 40 hours.

ALTER EGO: And how simple! Just select the proper electrode, use the new "Fleet-Fillet" Technique, boost the current—then speed like blazes!

Speed is right! At 50% operating factor, I used to make 15 feet per hour on these 3/8" fillets. Now, with this new "Fleet-Fillet" Technique, I'm getting 30 feet per hour. Twice as fast!

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Free copy "Fleet-Fillet" Bulletin No. 432 on request.

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ALTER EGO: Literally, "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

Cost Summary of Selected U.S.H.A.–Aided Housing Projects

Location and Name of Project	No. of Dwelling Units	Average No. Rooms per Unit	Estimated Costs Per Dwelling Unit: Over-all New Housing Cost[1]	Dwelling Facilities[2]	Net Construction[3]	Site Acquisition[4]	Site Improvement[5]	Non-dwelling Facilities[6]	Dwelling Bldg. and Equip.[7]	Fees and Overhead[8]	Estimated New Housing Cost
Alexandria, Va., John Roberts Homes	130	4.49	$4,288	$3,395	$2,745	$218	$375	$140	$2,924	$570	$557,399
Annapolis, Md., Bloomsberry Sq	50	4.34	4,622	3,788	3,027	565	317	103	3,187	719	231,109
Anniston, Ala	92	4.64	3,455	2,832	2,129	387	265	80	2,234	755	317,822
Atlanta, Ga., Capitol Homes Addition	179	4.28	4,426	3,667	3,034	673	313	57	3,157	615	792,364
Boston, Mass., Orchard Park	774	4.70	4,949	3,915	3,297	1,293	246	159	3,427	610	3,850,370
Burlington, N. J., Dunbar Homes	90	4.30	4,921	3,926	3,311	134	512	102	3,354	695	442,851
Calhoun County, Miss	22	5.50	2,206	1,840	1,618	52	260	...	1,643	234	48,530
Champaign County, Ill	70	4.34	4,443	3,607	2,861	158	401	96	2,931	817	311,000
Chicago, Ill., Frances Cabrini Homes	586	4.41	5,539	4,226	3,600	1,348	550	51	3,675	732	3,245,734
Chicopee, Mass	250	4.58	4,636	3,860	3,146	83	437	105	3,271	700	1,159,000
Cincinnati, Ohio, Lincoln Court	1,015	3.91	4,470	3,576	2,965	1,574	187	201	3,095	642	4,537,358
Clarksdale, Miss	112	4.21	3,374	2,565	1,927	68	475	73	2,088	614	377,881
Clovis, N. Mex	78	4.58	4,341	3,518	2,678	359	414	94	2,798	923	338,573
Conway, Ark	30	4.63	4,000	3,150	2,450	176	422	55	2,512	795	120,000
Dallas, Tex., Frazier Courts	250	4.48	4,160	3,538	2,901	231	319	81	3,092	540	1,040,140
Dayton, Ohio, Edgewood Court	138	4.09	4,334	3,515	2,825	897	392	92	2,955	721	598,040
Daytona Beach, Fla., Halifax Park	66	4.42	3,876	2,952	2,320	181	434	136	2,442	651	255,786
Denver, Colo., Las Casetas	195	4.82	3,848	2,942	2,336	323	455	89	2,411	676	750,419
Dothan, Ala., Henry Green Apts	102	4.50	4,177	3,320	2,611	330	418	137	2,863	570	426,033
E. Baton Rouge, La., Monte Sano Village	80	4.45	4,103	3,293	2,605	52	494	82	2,749	686	328,245
Fayetteville, N. Car., Cross Creek Court	56	4.39	3,721	2,901	2,301	108	417	122	2,441	619	208,356
Ft. Lauderdale, Fla., Dr. Kennedy Homes	108	4.19	3,971	3,003	2,386	304	365	116	2,529	598	428,828
Ft. Wayne, Ind., Westfield Village Addition	88	4.40	3,846	3,171	2,591	337	321	25	2,666	618	338,431
Frederick, Md., Roger Brooke Taney Homes	50	4.14	3,798	3,065	2,407	415	337	111	2,486	722	189,877
High Point, N. Car., Clara Cox Homes	250	4.27	3,761	2,931	2,385	378	450	86	2,527	517	940,135
Jacksonville, Fla., Jos. H. Blodgett Homes	708	4.30	3,218	2,512	2,006	976	255	79	2,143	496	2,278,574
Kansas City, Mo	401	4.72	4,897	4,003	3,478	734	435	102	3,528	615	1,963,096
Kinston, N. Car., Mitchell Wooten Courts	142	4.34	3,665	2,923	2,335	118	283	119	2,461	556	520,455
Little Rock, Ark	76	4.26	4,172	3,075	2,462	246	590	70	2,609	617	317,100
Long Branch, N. J	88	4.57	4,619	3,908	3,223	717	301	82	3,313	749	406,430
Los Angeles, Calif., Wm. Mead Homes	449	4.39	4,609	3,473	2,812	779	305	114	2,946	660	2,069,394
Louisville, Ky., Smoke Town	423	4.25	4,447	3,632	3,092	980	265	42	3,122	624	1,881,083
Lowndes County, Ga	56	5.50	2,194	1,929	1,712	45	165	...	1,712	247	122,848
Madisonville, Ky., Browning Springs	50	4.52	3,652	3,074	2,509	440	236	42	2,509	669	182,615
Memphis, Tenn	389	4.30	3,641	3,005	2,440	564	350	...	2,545	586	1,343,390
Mesa, Ariz	46	4.87	4,038	3,414	2,590	248	310	46	2,720	833	185,741
Moline, Ill., Springbrooke Cts	184	4.36	4,444	3,520	2,850	199	490	120	2,985	656	817,750
Nampa, Idaho	75	4.34	3,586	2,961	2,400	505	254	80	2,400	721	268,915
Nashville, Tenn., Cayce Homes Addition	36	4.67	4,090	3,489	2,797	519	292	9	2,933	680	147,217
New Albany, Ind., Beechwood Court	106	4.42	5,109	3,875	3,188	327	713	140	3,258	809	547,891
New Haven, Conn., Farnham Courts	300	4.47	4,652	3,657	2,994	1,157	277	153	3,120	684	1,395,548
New York, N. Y., Clason Point Gardens	400	4.63	5,268	3,960	3,280	674	404	70	3,361	719	2,107,098
Oakland, Calif., Lockwood Gardens	372	4.47	3,991	3,002	2,540	384	341	110	2,580	517	1,484,689
Oregon City, Ore	100	4.05	3,314	2,550	2,029	199	365	35	2,099	560	331,371
Paris, Tenn	24	4.54	4,030	3,083	2,354	199	522	84	2,459	821	96,715
Pittsburgh, Pa., Allegheny Dwellings	282	4.07	5,338	3,883	3,222	348	731	145	3,345	705	1,505,326
Portsmouth, Ohio, George W. Farley Square	135	4.24	4,026	3,284	2,562	685	326	78	2,692	738	543,536
Portsmouth, Va	174	4.57	4,628	3,722	3,063	803	350	100	3,113	815	805,258
Providence, R. I., Roger Williams Homes	744	4.61	4,370	3,588	3,048	773	288	90	3,173	494	3,251,643
Quincy, Ill., Indian Hills	200	4.26	4,611	3,854	3,054	67	372	135	3,224	764	922,139
Richmond, Va., Gilpin Court	301	4.29	4,312	3,534	2,892	712	336	67	3,034	632	1,297,947
Sacramento, Calif., New Helvetia	310	4.45	3,937	3,012	2,481	194	450	115	2,586	533	1,220,386
Sarasota, Fla., Newtowne Heights	60	4.20	3,410	2,874	2,250	94	234	90	2,371	584	204,619
San Francisco, Calif., Valencia Gardens	246	3.81	5,072	3,400	2,842	965	366	125	2,895	661	1,247,694
Scranton, Pa., Valley View Terrace	240	4.70	5,345	3,957	3,297	49	914	178	3,415	735	1,282,704
Seattle, Wash., Yesler Hill	690	3.99	4,242	3,223	2,677	622	487	140	2,735	644	2,927,257
Superior, Wis	156	4.18	4,320	3,449	2,738	600	453	104	2,853	783	673,909
Toledo, Ohio, Ravine Park Village	212	4.51	4,875	3,693	3,079	175	663	119	3,148	720	1,033,443
Tucson, Ariz	162	4.83	3,961	3,373	2,700	339	280	86	2,820	680	641,762
Twin Falls, Idaho, Washington Courts	56	4.86	4,220	3,452	2,718	191	415	63	2,798	814	236,331
Warren, Ohio, Trumbull Homes	224	4.33	5,080	3,927	3,003	138	662	118	3,133	1,011	1,137,957
Washington, D. C., Kelly Miller Dwellings	169	4.13	4,868	4,003	3,392	1,057	199	77	3,454	664	822,619
Wilmington, Del	202	4.63	4,754	3,587	3,010	426	561	79	3,085	657	960,252

Table Footnotes:

[1] "Over-all for new housing" consists of all costs of a development *except* the cost of slum buildings to be torn down, cost of land for future development, and the local housing authority's administrative, carrying and contingent expenses applicable to these excepted items. In the over-all cost of new housing, the following items involved in some developments are not included since they are not properly chargeable to the cost of new housing: (a) the cost of slum buildings to be torn down on the development site and (b) the cost of land for future development.

[2] "Dwelling facilities" is the total of the construction cost of dwellings (referred to in note 3 as "net construction"), dwelling equipment (such as ranges, refrigerators, screens, etc.) and the local housing authority's architectural, administrative, carrying and contingent expenses applicable to dwelling construction and dwelling equipment.

[3] "Net construction" is the construction cost of dwellings — i. e., structural, plumbing, heating, and electrical costs. The amounts shown do *not* include any allowances for changes and extras. The items contained in the "net construction cost" most nearly comprise the items contained in residential construction costs as compiled by the Bureau of Labor Statistics.

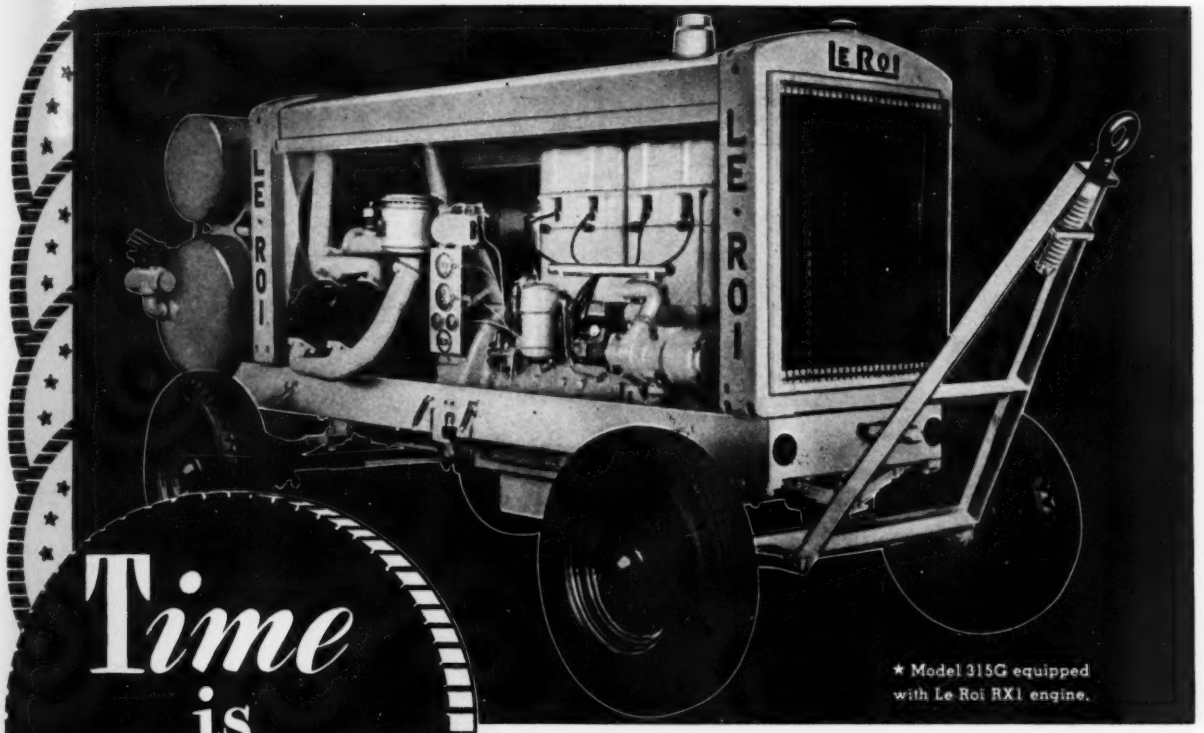
[4] "Site acquisition" consists of all costs that are chargeable to the procurement of a site for the development of a housing project. These include land for present development, acquisition expense and, if any, land for future development, cost of slum buildings to be torn down, relocation of tenants, and demolition.

[5] "Site improvement" consists of the cost of rough grading of land, excess excavation and foundation costs in connection with buildings, utilities, or other site improvements where the usual character of the subsoil or topsoil of the site is such as to require piling, caissons, underpinning, removal of solid rock or very unusual depth of footings; streets, alleys, and sidewalks or public rights-of-way transversing, adjoining or leading to the project site; utility mains, including storm and sanitary sewers; water, gas and electricity, street lighting, fire and police alarm systems; driveways, parking areas and walks on project property; playgrounds and similar surfaced areas; fences; clothes poles; landscape costs and miscellaneous improvements.

[6] "Non-dwelling" is the cost of non-dwelling buildings, spaces and equipment. These consist of such items as community buildings or spaces for use of the occupants of a project.

[7] "Dwelling buildings and equipment" consists of the cost of "net construction" (defined in note 3 above) and the cost of dwelling equipment which includes ranges, portable space heaters, refrigerators, movable cabinets or cupboards, screens, window shades, movable laundry equipment, etc.

[8] "Fees and overhead" consists of fees fixed by contract for architectural and engineering services, including fees for engineers and landscape architects, other professional fees for consultants and similar advisers, cost of the clerk of the works, inspectors, and other costs of inspection paid by the local authority. It also consists of sundry costs, such as travel in connection with architectural and engineering services, borings and test pits, blueprinting not otherwise furnished under the fixed fee contracts and models. Also includes the administrative costs of the local housing authority directly traceable to the project; the portion of those general overhead and statistical survey expenses properly allocable to the project; interest on funds for development costs borrowed; and that amount allowed for changes and extras.



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Procedure in Bidding and Building A Lump-Sum Camp Job

***Contents in Brief**—Awarding lump-sum contracts for complete cantonments to be built in three to four months, at a cost of many millions each, is a new procedure in army construction. Just how complete the plans are, how the job is broken down for bidding, how a contractor figures his bid under war-time conditions and then operates under this form of contract is revealed by analyzing one of these projects.*

SINGLE CONTRACTS for several large cantonments have been, and are being, let on a combination lump-sum and unit-price basis. Plans for these projects were prepared last year under separate engineering contracts that called for no construction supervision. Construction is under the direction of the Corps of Engineers. Except for speed and size, these contracts are exactly like the normal contracts the Corps of Engineers have been letting for years for dams, levees and navigation projects. They run into many millions each, with construction schedules as short as 120 days.

How does a contractor figure one of these big fast jobs under war-time conditions? Are the plans and specifications complete enough for intelligent bidding? How is the job broken down in the bidding schedule? How are materials provided for? Lastly, how does a contractor proceed with construction under this type of contract where he is comparatively free and unrestricted by the exigencies of the negotiated-fee type of work?

Answers to these interesting questions are provided by an analysis of the plans and bidding requirements, the bidding procedure and the construction operations of a new triangular division cantonment being built under a single lump-sum contract in the West. The contractor says the bidding was not so difficult, even under existing conditions. All he did was to consider in detail, probably more closely than usual, all possible items of cost, price them according to current labor rates and quoted material prices as in normal times, then add a certain amount for contingencies—enough to meet the conditions of the times, but not too much or the other fellow would be low.

Plans and specifications, after some changes and addenda by the Corps of Engineers just prior to bidding, were found to be satisfactorily complete. In some instances the items were probably detailed too far in the bidding schedule, in others they were rather vague—but those conditions have applied to almost every contract since the building of the Pyramids.

The bid schedule was broken down into unit prices for each of various classes of buildings complete, and for grading, trenching, pipelaying, road surfacing, railroad track, etc., that make up the utilities and transportation services. Some materials are provided by the government at a stated price; the rest are obtained by the contractor in the open market under an A-1-j priority.

How does the contractor operate under this form of contract? Exactly the same as on a normal federal project. Because successful prosecution of the work is the sole responsibility of the contractor, he is free from many of the restrictions, control and direction by several agencies, such as is the case in negotiated-fee type of work. The difference is greater than may be apparent at first. Paper work, office routine, accounting, purchasing, cost-keeping, time checking and all other management details are much simpler under the lump-sum type of contract.

Job breakdown

The bidding schedule was broken down into several sections, such as buildings, roads, railroads, water and sewer systems and plants, electrical distribution systems and motor fuel supply facilities.

This camp will house a streamlined triangular division, so requires not only the usual barracks, mess halls, officers' quarters, administration and

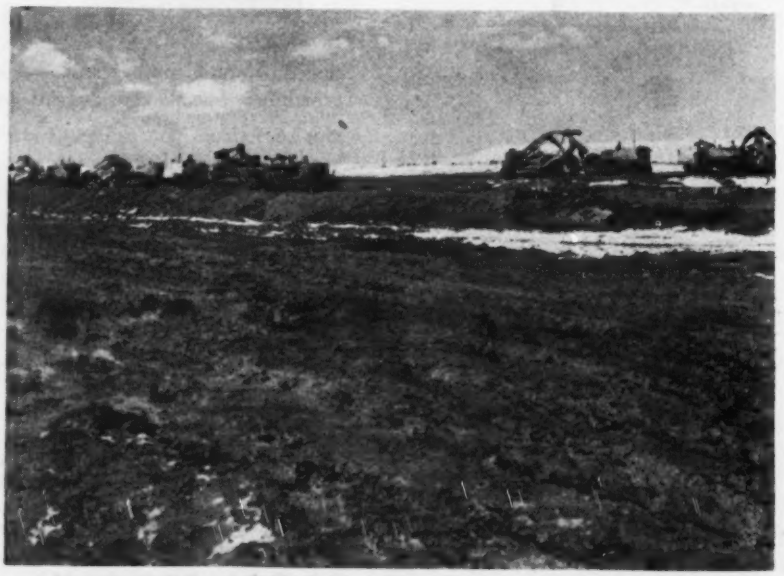

Fig. 1. One of the first jobs to be taken care of in this western cantonment construction is site grading in the mud.

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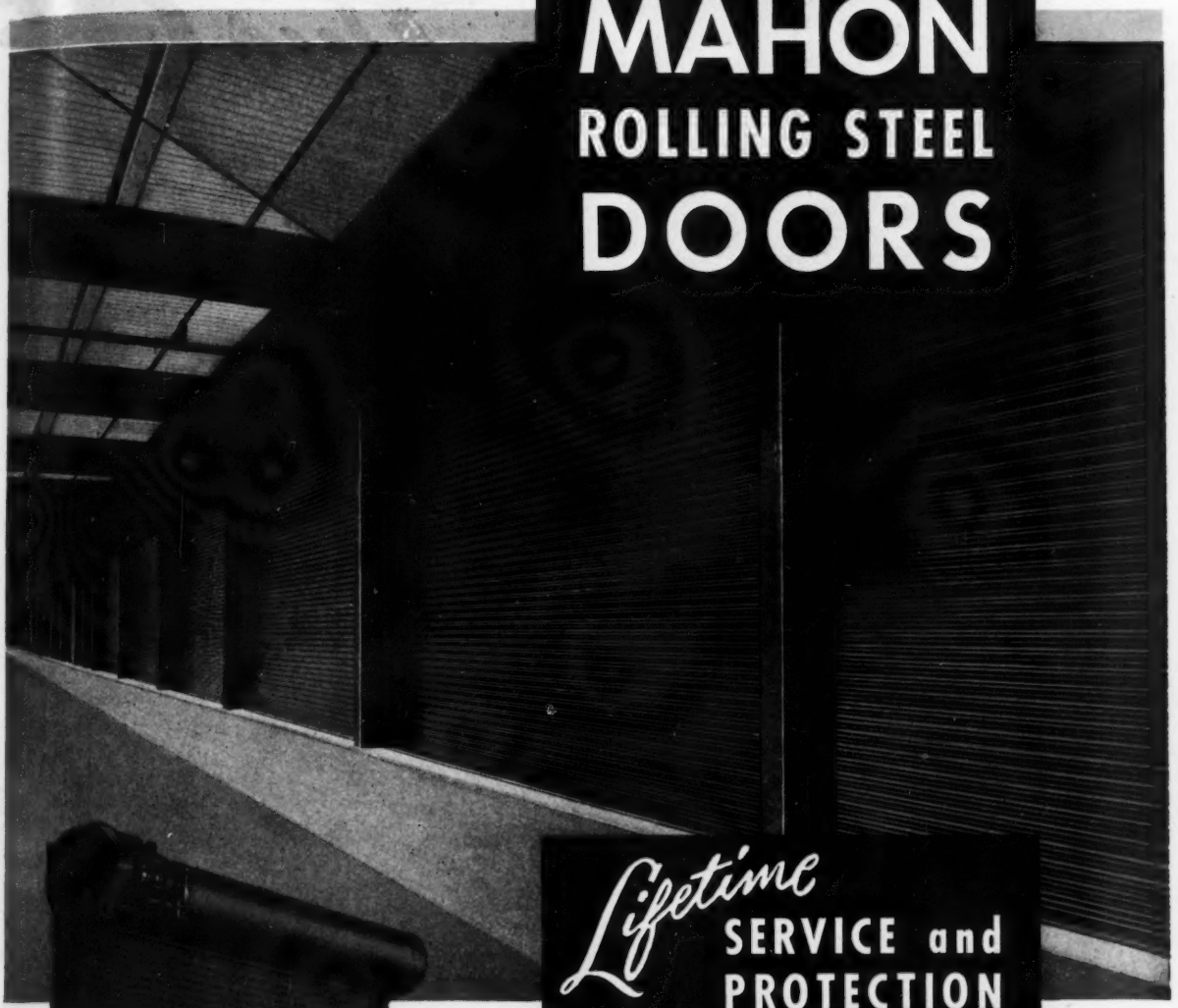

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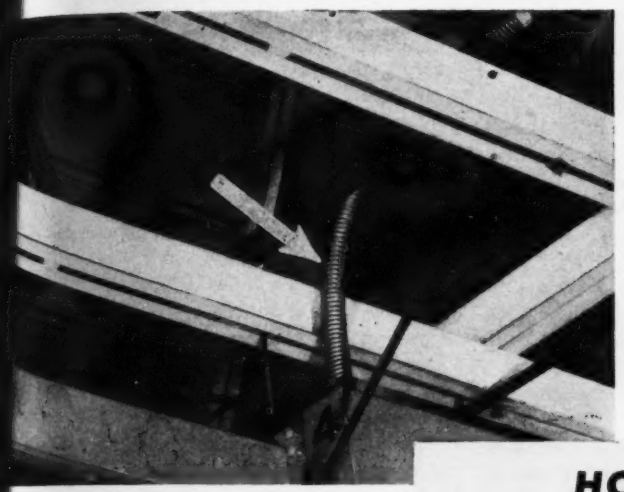
Saves Vital Materials and Goes Up Fast

*No. 1799 Varnished-cambric Interlocked-armor Power Cable



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	COPPER	STEEL	OTHER	TOTALS
Conventional Radial—with Rubber Cable* and Conduit	18,500	43,500	4600 (mostly rubber insulation)	66,600
Conventional Radial—with V-C INTERLOCKED-ARMOR CABLE	13,600	5,070	4420 (rubber negligible)	23,090
SAVINGS	4,900	38,430	180	43,510
Load Center—with Rubber Cable* and Conduit	4,560	16,150	4190 (947 lb rubber)	24,900
Load Center—with V-C INTERLOCKED-ARMOR CABLE	3,420	2,015	4140 (rubber negligible)	9,575
SAVINGS	1,140	14,135	50	15,325

*Based on 30%, 60 C rubber insulation.

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GENERAL ELECTRIC

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recreation buildings, but many shops and warehouses. There are some 1,500 buildings involved, divided into 130 classes or types. Most buildings are of wood construction, except the hospital group, which was bid under four alternates, with a cinder concrete block design being accepted.

Each building was bid on a lump-sum basis, complete with the exception of grading, excavation and concrete foundations. All buildings falling into one class were bid as units. Thus, the barracks were listed as so many buildings "Type ...., each, complete, $....." The same procedure was followed in listing each of the 130 types. Excluded from the unit price for each building are: pile foundations (required for only a few heavy structures), price per linear foot; fencing in building areas, price per linear foot for various types; covered walks in hospital group, price per linear foot for various types; steam distribution system in hospital group, lump sum; site grading for all building areas, per cubic yard; concrete for footings, piers, basements and pile caps (excluding floors which are included in building prices), per cubic yard; reinforcing, per pound; and rock excavation, per cubic yard.

All railroad construction within the reservation is largely on a unit-price basis. A spur between the main line and the reservation was built under a previous contract. Clearing and grubbing for the railroad is a lump sum. Excavation is divided into two unit-price classes: placed in embankment or wasted, and placed in embankment from borrow-pits, both on a unit-price per cubic yard basis with a free haul of 800 ft. and a separate price for overhaul. Pipe culverts are on a price per foot basis. Two classes of track, new or relay rail, are set up on a price per linear foot, including ties but not ballast, which is paid for by the cubic yard. Road crossings, turnouts and crossovers are listed as separate units.

The motor fuel supply section includes gasoline stations and pump houses, per unit; gas stations without pumps, per unit; and gasoline storage tanks, per unit.

In the water distribution system practically all items are on a unit-price basis, broken down as follows: various types and sizes of pipe, per linear foot in place, including trenching and backfilling; branches, valves, fire hydrants, etc., per unit in place.

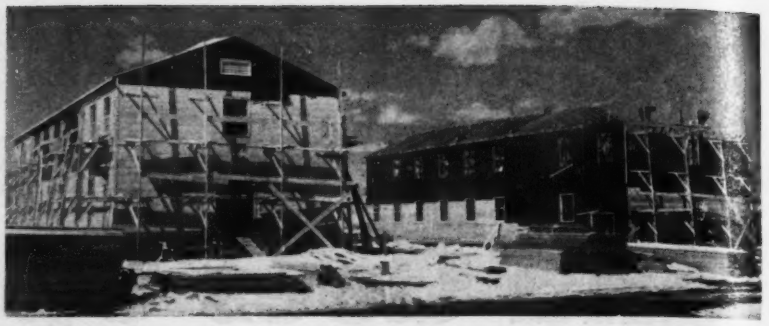

Fig. 2. Experimental barracks were put up to determine most suitable method of framing and type of exterior.

Rock excavation has a separate price, as also does sheeting left in place at the order of the engineers.

Water lines can be laid at fairly constant depth, but sewers, of course, must follow certain grades involving variations in trench depths. Therefore the sewer section is set up as various sizes and types of pipe per linear foot in place excluding trenching and backfilling. Excavation and backfilling is broken down into two general classes: for pipe under 18 in., and that over 18 in. Then each class is further detailed as to depth up to 6 ft. and in 2-ft. intervals from 6 to 12 ft., priced at linear foot of trench. Rock excavation carries a separate price. Manholes and inlets are listed as units, with a unit price per foot for excessive depths.

Water storage, sewage treatment, incinerators and magazines (igloos) are all broken down into operating units, including a 1-m.g. reservoir, each listed on a lump-sum basis. Excavation is paid for by the cubic yard, and the piping between, but not within, the various units is by the linear foot in place. The electrical distribution system for the sewage plant is separate. Fencing is listed per foot.

Road building is entirely on a unit-price basis, except for total clearing of the cantonment site, included in this section as a lump sum. Grading is per cubic yard, unclassified, with a separate price for overhaul. Various stabilized road bases are set up per cubic yard in place, and gravel surfacing is the same. Concrete paving is per square yard, and bituminous plant mix material is listed at a price per ton. Other bituminous materials are by the gallon. All culverts and drains are per linear foot, including excavation. Each of several timber bridges in the highway system is carried on a unit-price basis, complete.

In the electrical distribution system poles are listed as unit prices according to class and height. Various sizes of transformers are on a unit-price basis, but transformer mountings are separate. All conductor wire is on a price per foot, while the various assemblies are carried as units.

Bidding the job

The foregoing breakdown of the job gives an idea of the bidding requirements. The project was not advertised, and only those contractors who had qualified with the U. S. district engineer in charge and who, in his opinion, were capable of performing the work, were allowed to bid. Three bids were received on this particular job.

The successful contractor was a group of several firms banded together for the first time in this particular combination for the purpose of bidding this specific project. Included in the combination are well-known building, highway and heavy construction firms. All provisions of the standard government contract had to be followed, including the furnishing of payment and performance bonds.

Upon the formation of the combination the various member firms agreed to their share of contribution to the venture. Each firm prepared bids on one or more sections, according to his ability and experience, but at least two independent bids were made up for each section. First, however, a general plan of estimating was outlined, including determination of just what cost items should be included as direct charges and those to be classed as overhead. Thus, each independent bid was prepared on a basis comparable with the other.

Every effort was made to keep the

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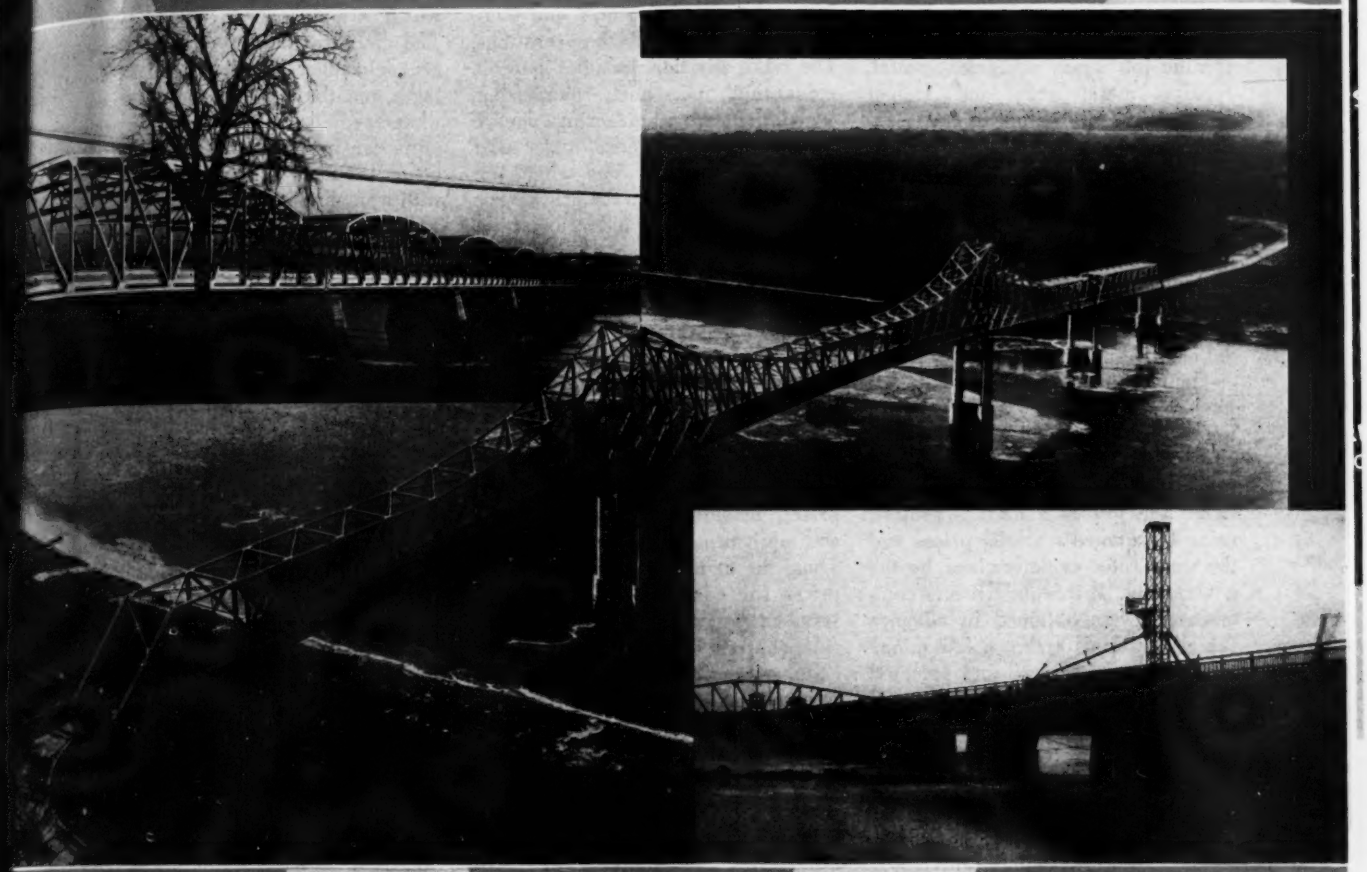

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Clinton Bridge Works, Clinton, Iowa
Duffin Iron Company, Chicago, Illinois
Gage Structural Steel Co., Chicago, Illinois
Midland Structural Steel Co., Cicero, Illinois

overhead charges low by throwing all costs possible into direct field costs. Direct costs include everything except office overhead and general field supervision. Compensation and other insurance, taxes, where applicable to specific job items, equipment rental, repairs, maintenance and freight charges, expediting and traveling expenses in connection with definite materials or job items, are all in the direct costs. Temporary roads, railroads, buildings, water supply and power are all overhead items, as are also the bond costs, all engineering services and the office force. Contingencies were included as overhead, not charged against the specific items.

There are more than 500 bid items. Each was carefully analyzed down to the last detail, so the bid represents an intelligent study, not merely a guess. Estimators were instructed to figure the job as a normal project, using the quoted material prices and the wage rates as determined by the government. Prices and delivery commitments were obtained in advance for all materials except a few minor items. Quotations used and accepted were largely on a delivery basis, and the lowest figure was not always used if delivery dates were not as desired. A group of 50 estimators worked two weeks in preparing the bid.

After the various section estimates were made up, the final bid was determined by a board of strategy made up of top executives of the various member firms who compared the various independent bids and arrived at a compromise on all differences. To the estimates, as determined by known costs alone, the board added certain contingencies. The final result was a bid about 10 percent lower than the second-best proposal.

Job operations

The contractors, to meet the construction schedule, have set up to produce at the rate of $1,500,000 per week, or more than $200,000 per day, which is fast going on any job. Taking into consideration the time of getting organized and for finishing up, peak operations will probably be about twice that rate. Job operations are broken down into three major divisions: office, buildings and utilities (including roads and railroads). Each division is headed by a manager, and these three men comprise the executive operating committee in full charge of the construction program. There is no general, single project manager, but the job is proceeding on schedule under the three-man rule. Each division manager is assigned a chief engineer and engineering staff to aid in the operations. The office division includes payroll, accounting, personnel, purchasing, expediting and engineering departments. A fourth official looks after the hospital group, but while this work is separate from the general run of buildings it is included under the building division.

Handling of equipment is interesting on this project. The executive committee determines what equipment is required and asks each member of the firm what they can do to meet the requirements. A complete rental schedule was drawn up covering every class of equipment, and member companies are paid these scheduled rental prices, including freight to the job and equivalent freight away from it. Thus, the members all get the same prices for equipment. When necessary, equipment is rented from outside sources at whatever rates are necessary to obtain the desired units. Strangely enough, the Army is renting to the contractor considerable equipment that has been recaptured on other projects. Contractor-owned equipment on this project, of course, is not subject to recapture. All equipment, regardless of who supplies it, must be in good working condition before it goes on the rental schedule. Repairs and maintenance are charged to the job, but the owner must stand depreciation and normal wear.

The contractor is given some latitude by the specifications as to the type of framing and outside finish of the wood buildings. The two-story barracks may be either the so-called Western or platform type of framing, in which the studs break at the second floor level, or may be balloon framing in which the studs run to the full two stories. Exterior of the wood buildings calls for gypsum board sheathing over the studding, but the outside may be either drop siding or cement-asbestos shingles over waterproof paper. To determine the type best suited, the contractor built a couple of experimental barracks, one of the balloon type of framing with shingle exterior finish, the other as Western framing with drop siding. The drop-siding exterior was finally adopted. The method of framing largely depends upon the availability of lumber, most of which is being supplied by the government under allocations from previous commitments. Balloon framing requires 2x4-in. studs 18 ft. long, which are difficult to get at times. The merits of each type of framing are debatable. Each has its advantages, but the Western type is somewhat favored here because the wall units can be fabricated and squared up on the floor and raised into place with a small crew.

The contractor is paid on semi-monthly estimates. A new provision calls for a discount of 0.25 percent if the estimates are paid within seven days from the time of approval by the area engineer. Retained percentage amounts to 10 percent until the job is half done, then it is reduced to 5 percent. In estimating the amount due for buildings under various stages of construction, each building is broken down into four items: framing, roof, finish and mechanical. Each item is assigned a proportion of the unit bid price, and by estimating the percentage of completion of each item for every building, the semi-monthly estimate is compiled.

The general contractors have awarded more than a dozen subcontracts, but are doing the major share of the work themselves. Water, gas, and power for the camp will be provided from outside sources, and the supplying agencies build the service lines to the boundaries of the military reservation.

All labor is organized, supplied by local unions. The peak force will probably be between 12,000 and 14,000 men.

Engineering organization

For the Army the project is supervised by an area engineer who is an officer in the Corps of Engineers reporting to the district engineer in that area. The division engineers have general supervision over all work in their districts, and final control of all army construction rests with the office of the chief of engineers.

There is no architect-engineer on this project, and all job relations are handled between the area engineer and the contractor. However, a member of the engineering firm that prepared the original plans is retained as a consulting engineer to the area engineer, but he does not have any supervision over the contractor. Thus, the contractor deals with only one party.

Trend of Building Costs in Chicago

Max Fuhrer

Eugene & Max Fuhrer, Architects-Engineers
Chicago, Illinois

A MANUAL of Chicago building costs compiled by Eugene and Max Fuhrer, Architects and Engineers, was published by the Chicago Real Estate Board as of Mar. 1, 1935. Revisions were compiled as of Mar. 1, 1938, and Feb. 1, 1941, to indicate the trends. It was the intention of the authors and publishers to review and compile revised cost sheets whenever necessary, to maintain standard unit cost figures correct to within the accuracy of the usual estimate or appraisal.

Approximately six months after the revision of Feb. 1, 1941, construction costs in the Chicago metropolitan area were greatly affected by the impact of defense and then war activities. The initial effects were occasioned by periodic heavy demands on one or more building trades. These caused an immediate fluctuation of labor cost estimates varying with the size of each project. Materials were similarly affected, first by uncertainty, then apparent growing shortages and lack of familiarity with the expanding priority controls. Bids disclosed wide variations in like trades, depending on whether materials were on hand or were purchased from the rapidly depleting stocks of wholesalers and jobbers.

The apprehension of the future and uncertainty of the present were dispelled by the recent WPB order, stopping private non-war construction. This left the field clear for the heavy demands of war construction activities, but it also eliminated the source of data required to compile the Chicago Building Cost Manual.

The primary factors such as material costs and labor rates can be ascertained, but such elements as productivity of labor and the prevailing contractors' items of profit, overhead and risk for private construction cannot be determined. However, continuation of cost trend indexes is highly essential for present and future economic needs, and, therefore, such indexes as the *ENR* Construction and *ENR* Building Indexes must be used. These indexes are based on a set formula for which the material and labor items are obtainable and the data in the accompanying tables has been compiled by applying Chicago material and labor costs to this formula. In lieu of the non-detailed cost information heretofore available it is believed that the data herewith will meet the needs of valuation, appraisal and building interests.

TABLE 1—HOURLY LABOR SCALE FOR VARIOUS BUILDING TRADES—CHICAGO

Trade	1926	1929	1932	1935	1938	Jan. 1941	Apr. 1942
Bricklayers	$1.625	$1.70	$1.375	$1.50	$1.70	$1.70	$1.70
Carpenters	1.50	1.625	1.313	1.313	1.625	1.625	1.625
Common labor	.90	.975	.825	.825	1.025	1.025	1.025
Electricians	1.563	1.70	1.50	1.50	1.70	1.70	1.70
Painters	1.50	1.625	1.41	1.333	1.667	1.667	1.725
Plasterers	1.625	1.70	1.375	1.50	1.70	1.70	1.825
Plumbers	1.50	1.625	1.375	1.375	1.60	1.70	1.70
Steamfitters	1.375	1.70	1.375	1.375	1.70	1.70	1.70
Structural steelworkers	1.50	1.625	1.355	1.355	1.70	1.70	1.70
Glaziers	1.50	1.675	1.70	1.70	1.943	1.943	2.00

TABLE 2—UNIT COST OF VARIOUS BUILDING MATERIALS—CHICAGO

Material	1926	1929	1932	1935	1938	Jan. 1941	Apr. 1942
Common brick, M	$12.00	$12.00	$10.20	$10.20	$10.50	$10.30	$12.50
Portland cement, bbl	2.35	1.75	1.80	2.45	2.20	2.25	2.30
Gravel, yd	2.75	1.75	2.25	2.60	2.00	1.85	2.15
Torpedo sand, yd	2.75	1.75	2.25	2.45	2.00	1.85	2.15
Gypsum plaster, ton	20.00	17.00	15.00	17.00	15.00	14.00	16.00
4 in. clay tile, M ft	94.00	70.00	54.20	70.40	70.40	72.60	77.00
Lumber, M	48.00	40.00	35.00	48.50	52.00	57.60	60.00
Struct. steel shapes, f.o.b. Chicago, cwt	2.10	2.03	1.69	1.85	2.30	2.10	2.10

TABLE 3—APPLICATION OF CHICAGO LABOR AND MATERIAL PRICES TO THE *ENR CONSTRUCTION COST INDEX FORMULA*

	1929		Mar. 1, 1935		Mar. 1, 1938		Feb. 1, 1941		Apr. 1, 1942	
	Unit	Index	Unit	Index	Unit	Index	Unit	Index	Unit	Index
Steel, 25 cwt.	2.03	50.75	1.85	46.25	2.30	57.50	2.10	52.50	2.10	52.50
Lumber, 1.088 Mbf.	40.00	43.52	48.50	52.77	52.00	56.57	57.60	62.67	60.00	65.28
Cement, 6 bbl.	1.75	10.50	2.45	14.70	2.20	13.20	2.25	13.50	2.30	13.80
Common labor, 200 hr.	.975	195.00	.825	165.00	1.025	205.00	1.025	205.00	1.025	205.00
TOTAL		299.77		278.72		332.27		333.67		336.58
Percentage variation, based on Mar. 1, 1935		107.5		100.0		119.2		119.7		120.7
Percentage variation, based on Feb. 1, 1941		.....		.....		.....		100.0		100.8

TABLE 4—APPLICATION OF CHICAGO LABOR AND MATERIAL PRICES TO THE *ENR* BUILDING COST INDEX FORMULA

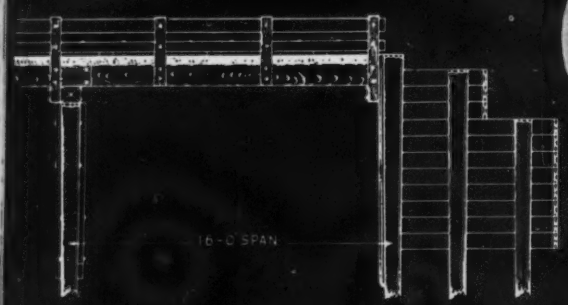
	1929 Aver.		Mar. 1, 1935		Mar. 1, 1938		Feb. 1, 1941		Apr. 1, 1942	
Steel, 25 cwt.	2.03	50.75	1.85	46.25	2.30	57.50	2.10	52.50	2.10	52.50
Lumber, 1.088 Mbf.	40.00	43.52	48.50	52.77	52.00	56.57	57.60	62.67	60.00	65.28
Cement, 6 bbl.	1.75	10.50	2.45	14.70	2.20	13.20	2.25	13.50	2.30	13.80
Skilled labor, 68.38 hr.	1.6638	113.77	1.4385	98.36	1.7038	116.51	1.7150	117.27	1.7416	119.09
TOTAL		218.54		212.08		243.78		245.94		250.67
Percentage variation, based on Mar. 1, 1935		103.0		100.0		114.9		115.9		118.1
Percentage variation, based on Feb. 1, 1941		.....		.....		.....		100.0		101.9

TABLE 5—PERCENTAGE VARIATIONS IN *ENR* INDEXES AT SELECTED PERIODS

	Aver. 1929	Mar. 1935	Mar. 1938	Feb. 1941	Mar. 1942
ENR Construction Cost Index	207.02	194.41	238.79	250.50	269.71
Percentage variation, based on 1935	106.7	100	122.8	128.8	138.7
Percentage variation, based on 1941	.....	.....	.....	100.0	107.6
ENR Building Cost Index	190.9	164.1	199.3	208.4	218.88
Percentage variation, based on 1935	166.3	100.0	121.4	126.9	133.30
Percentage variation, based on 1941	. . .	. . .	. . .	100.0	105.0

Where SHORTAGES are blocking needed construction...

use Pressure-Creosoted Wood



ONE COUNTY SAVED 40%. This bridge was built in 1922 by an Alabama county for H-10 loading. Total length: 96′; number of bents: 7; width of roadways: 18′; span length: 16′; cost per sq. ft.: $2.67; total cost of bridge: $4,769.27. Estimated cost if bridge had been built of other permanent materials: $8,000. Saving: 40.5%.

A lot of needed construction, stopped in the project stage by shortages of critical materials, can be completed *now*—with the help of pressure-creosoted wood. Even the prospect of greatly reduced budgets isn't a bar, for pressure-creosoted wood gives a permanent structure at remarkably low initial and annual cost.

For many years, highway departments throughout the country have regularly used pressure-creosoted wood for bridges, culverts, retaining walls, platforms, and similar applications, because of its numerous advantages. Pressure-creosoting makes wood a permanent construction material; many bridges, particularly in heavy railroad service, are still in use after 30 years. Since creosote also gives the wood an enduring "paint job," periodical painting is not required.

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Engineering details and comparative costs are given in our bulletin, "Typical Highway Bridges of Pressure-Treated Timber." Ask for a free copy.

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Contract Unit Bid Prices

Selected list of 93 projects showing how contractors bid in 1941-1942

INDEX TO PROJECTS COVERED

Project	Page
BUILDINGS	
Mill Creek Pumping Station, Ohio	191
Pumping Station, Pa.	192
Arsenal Wharf, Warehouse, Calif.	192
Powerhouse Superstructure, Mont.	194
Pumping Plant, Ore.-Calif.	194
Garage, Shop Buildings, etc., Idaho	196
Chemical Storage Building, Mo.	196
Ordnance Depot Dock, S. C.	196
RAILROADS	
Railroad and Telegraph Line Relocation, Idaho	199
Railway, Highway Relocation, Ore.	199
Railroad Roadbed, Tunnels, Alaska	200
DAMS	
Anderson Ranch Dam and Power Plant, Idaho	200
Wolf Creek Dam, Ky.	202
Spillway and Embankment, Blue Mountain Dam, Ark.	204
Embankment and Spillway, Youghiogheny Dam, Pa.	204
Bluestone Dam, W. Va.	207
Wallace Lake Dam, La.	207
Berlin Dam, Ohio	208
Keswick Dam, Calif.	208
St. Lucie Dam, Fla.	209
Santa Fe Dam, Calif.	209
Tunnels, Granby Dam, Colo.	210
HIGHWAYS	
Highway, Missouri	210
Highways, Wyoming	212
Highway, Maryland	212
Highway, Utah	214
Access Road, Ypsilanti, Mich.	214
Highways, Michigan	214
Highway Improvements, Ohio	216
Highways, New York	219
Highway Widening, Delaware	219
Highway Widening and Resurfacing, Ind.	220
Street Paving, Richmond, Ky.	220
Brick Street, Detroit, Mich.	222
Concrete Pavement, Kansas	222
Highway Improvements, Nevada	222
Highway Surfacing, Montana	224
Highway, North Carolina	224
Highway Relocation, Washington	224
Highway, Massachusetts	226
Highway, Texas	226
BRIDGES	
Foundation Walls, Duquesne Way, Pa.	226
Bridge and Highway, Colo.	227
Bridges and Highway, Pa.	227
Bridge and Highway, Ohio	228
Causeway, Mich.	228
Overpass, Vt.	230
Viaduct, Seattle, Wash.	230
Bascule Bridge, Fla.	232
Bridge and Approaches, Mont.	232
Bridge and Approaches, Ga.	232
Underpass, S. C.	234
Grade Separation, Washington, D. C.	234
State St. Bridge, Chicago, Ill.	234
Underpass and Approaches, N. M.	235
Bridge, Ky.	235
Bridge, Pa.	236
WATERWORKS	
Water Mains, Mich.	236
Water Supply System, Nev.	236
Filtration Plant, etc., Va.	238
Water Supply Dam, W. Va.	238
San Vicente Dam, Calif.	240
Water Supply and Sewerage Systems, Calif.	240
SEWERAGE	
Sewage Plant Buildings, Chicago	242
Sewerage Tunnel, Cleveland, Ohio	242
Sewer Improvements, Corpus Christi	244
Sewage Plant Additions, Middletown, Pa.	244
Sewage Treatment Plant, N. Y.	246
Sewer Extensions, Md.	246
Sewerage System, Waynesville, Mo.	247
AIRPORTS	
Clearing, Grading Airport, Ariz.	247
Airport Paving, Drainage, N. Y.	247
Paving Runway, Taxiway, Wash.	248
Runway and Taxiways, Calif.	248
Chemung County Airport, N. Y.	248
Airport Drainage, Morristown, N. J.	250
Airport Improvement, Fargo, N. D.	250
Airport Paving, Houston, Tex.	252
Moving Target Range, Nevada	252
TUNNELS	
Excavation, Concrete Invert, Continental Divide Tunnel, Colo.	254
Brooklyn Tunnels, Brooklyn-Battery Tunnel, N. Y.	254
Manhattan Tunnels, Brooklyn-Battery Tunnel, N. Y.	256
Pedestrian Tunnel, Cleveland, Ohio	258
EARTHWORK, IRRIGATION, DRAINAGE	
River Improvement, Los Angeles, Calif.	258
Flood Protection, Paducah, Ky.	260
Mississippi River Lock and Dam	260
Charenton Floodgate, La.	262
Flood Protection, Elmira, N. Y.	262
Revetment, Nebraska	262
Flood Wall, Ohio	264
Steel Bulkhead, N. Y.	264
Earthwork and Structures, Mont.	264
Reservoir, Tenn.	264

MILL CREEK PUMPING STATION CINCINNATI, OHIO

OWNER: U. S. Engineer Office, Cincinnati, Ohio. Lt. Col. Fred T. Bass, district engineer.

PROJECT: Construction of brick and concrete pump station, 90 by 270-ft., on Mill Creek in Cincinnati, Ohio. Work involves conduits for electric wiring; discharge bay; abutment; fender wall; concrete walls (reinforced) of various sizes; concrete flood walls, earth embankment and ramps; movable gate closures; sewers; reinforcing and removal of portions of existing sewers; and other appurtenant work. This is largest pump plant ever built. To house six pump units, each with 1,500 c.f.s. capacity for a 29-ft. head. Space is allowed for three additional pump installations if future needs require.

CONDITIONS: Contractor to furnish all materials except pumps, motors and their accessories, and complete work in 700 calendar days. Project to be built on concrete piling. Alternates were allowed on precast or cast-in-place piling, the contract award being made on former basis. Specifications contained "escalator clause" which stated that adjustments in bid prices would be made if material and labor prices changed. Bureau of Labor Statistics data on prices and labor rates to be basis of measurement. Adjustments to be based on labor being 32 percent of cost and materials 38 percent. Low bidder's figure based on inclusion of "escalator clause"; third low substituted a clause which states that if any difference in wage rates listed in specifications and those actually paid exists during the life of the contract, the government is to reimburse the contractor monthly for the actual difference. Variations in material prices to be adjusted on similar basis. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.50 to $1.62½ per hr.; semi-skilled, $1.00 to $1.40; and common, 75c.

BIDS: Six bids were received September 30, 1941, ranging from the contract low of $2,439,642 to $2,720,189. Engineer's estimate, $2,422,146. Awarded October 6, 1941. All bids rejected on opening scheduled July 29, 1941.

LIST OF BIDDERS:

1. Ferd J. Robers Constr. Co., Burlington, Wis., and LaCrosse Dredging Corp., Minneapolis, Minn. (contract) $2,439,642
2. Patton-Tully Transportation Co., and Badgett Constr. Co., Memphis, Tenn. 2,483,141
3. Spencer, White & Prentis, Inc., New York, N. Y. (substituted escalator clause) 2,593,689
4. Fegles Constr. Co., Ltd., Minneapolis, Minn., and United Constr. Co., Winona, Minn. 2,685,690
5. Ferro Concrete Constr. Co., Cincinnati, Ohio 2,698,421
6. Spencer, White & Prentis, Inc., New York, N. Y. (escalator clause omitted) 2,720,189

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Diversion, care of stream, unwater found	L. S.	$250,000.00	$250,000.00	$310,000.00
2. Clear, grub, and remove structures	L. S.	9,000.00	27,500.00	15,000.00
3. Excavation	265,000 c. y.	.60	.90	1.00
4. Excav. in borrow areas	7,000 c. y.	.50	.90	1.00
5. Embankment	21,000 c. y.	.50	.15	.25
6. Seeding	1 ac.	100.00	300.00	400.00
7. Fertilizer	0.5 ton	100.00	100.00	100.00
8. Compacted backfill	85,000 c. y.	.75	.40	.50
9. Sand and gravel filters and drains	14,900 c. y.	2.00	2.50	2.70
10. Collector drain, 6-in.	200 l. f.	1.00	2.00	2.00
11. Collector drain, 12-in.	170 l. f.	2.50	2.75	4.00
12. Pipe drain, 12-in.	315 l. f.	2.00	2.75	3.00
13. Remove Mill Creek intercept. sewer	660 l. f.	18.00	15.00	20.00
14. Dumped riprap	13,600 c. y.	5.00	6.00	7.00
15. Derrick stone	1,400 c. y.	7.00	10.00	12.00
16. Class B concrete	2,000 c. y.	30.00	40.00	35.00
17. Class C concrete	43,000 c. y.	21.30	19.00	19.00
18. Reinforcing steel	4,400,000 lb.	.055	.06	.05
19. Structural steel	950,000 lb.	.12	.12	.10
20. Precast conc. piles (vertical)	18,500 l. f.	2.70	2.75	2.50

21. Precast conc. piles (battered)	73,500 l. f.	3.00	2.75	3.00
22. Cut off precast conc. piles	1,800 ea.	7.00	4.00	5.00
23. Steel sheet piling (23# per s. f. of wall) vertical	21,200 s. f.	1.50	1.50	2.00
24. Steel sheet piling (battered, 27# per s. f. of wall	9,600 s. f.	2.00	2.15	3.00
25. Pump sta. superstr. above El. 512 incl. brick veneer on walls and pilasters below El. 512, except as noted	L. S.	54,000.00	55,000.00	67,000.00
26. Bulkhead storage cars	6 ea.	150.00	1,300.00	1,000.00
27. Overhead traveling crane	L. S.	19,000.00	11,000.00	20,000.00
28. Motor drying system	L. S.	1,750.00	4,300.00	4,000.00
29. Steel conduit, 1¼-in. dia.	1,200 l. f.	.80	.80	.50
30. Steel conduit, 1½-in. dia.	900 l. f.	.60	.75	.60
31. Steel conduit, 2-in. dia.	4,200 l. f.	1.00	1.05	1.00
32. Steel conduit, 3-in. dia.	650 l. f.	1.20	1.75	1.50
33. Steel conduit, 3½-in. dia.	700 l. f.	1.20	2.15	2.00
34. Steel conduit, 4-in. dia.	275 l. f.	2.00	2.75	2.60
35. Steel conduit, 4½-in. dia.	120 l. f.	2.50	3.40	3.00
36. Conduit fittings for convenience receptacles, wall switches, lighting fixtures	150 ea.	1.20	5.00	5.00
37. Fiber conduit	450 l. f.	1.20	1.25	1.00
38. Inst. equipt. to be furn. by Govt.	900 ton	45.00	60.00	70.00
39. Hand rail, 1½-in., welded	20 l. f.	2.00	3.00	5.00
40. Hand rail, 2-in., ball pattern	950 l. f.	2.50	4.50	6.00
41. Hand rail, 1½-in., ball pattern	620 l. f.	2.00	3.00	5.00
42. Miscellaneous metals	66,000 lb.	.15	.15	.20
43. Gravel surfacing	900 s. y.	1.00	2.00	2.00
44. Track, fittings, ballast (storage yd.)	112 tr. ft.	3.50	5.00	7.00
45. Track, fittings, ballast (spur track)	330 tr. ft.	4.50	5.00	10.00
46. Rails and fittings (overhd. crane)	520 rail ft.	2.00	4.00	3.00
47. Rails and fittings (rake and transf. platform)	1,360 rail ft.	1.50	3.00	3.50
48. Oak timber	10,000 ft. bm.	.15	.15	.30
49. Fencing, complete	180 l. f.	2.00	3.00	8.00
50. Cast steel	400 lb.	.25	.30	.50
51. Cast iron	3,000 lb.	.10	.10	.10
52. Bronze	1,850 lb.	.50	.60	.50
53. Grating, 1x⅛-in.	30 s. f.	1.50	2.50	3.00
54. Grating, 1½x⅛-in.	1,670 s. f.	2.00	3.50	4.00
55. Grating, 1⅝x⅛-in.	430 s. f.	2.00	4.50	5.00
56. Grating, 2⅝x⅛-in.	530 s. f.	3.00	5.50	6.00
57. Grating, 4x⅛-in.	275 s. f.	3.00	6.50	7.00
58. Piezometer piping, complete	L. S.	1,200.00	2,500.00	3,500.00
59. Misc. piping and plumbing for pump sta. below El. 512	L. S.	1,200.00	3,000.00	4,000.00
60. Doors and frames below El. 512	4 ea.	150.00	75.00	100.00
61. *Cast-in-place conc. piles (vertical)	18,500 l. f.	3.70	No. bid	4.50
62. *Cast-in-place conc. piles (battered)	73,500 l. f.	3.70	No bid	4.50
63. *Cut off cast-in-place piles	1,800 ea.	1.00	No bid	2.00

Alternates for items 20, 21 and 22.

PUMPING STATION, HANOVER TOWNSHIP, PA.

OWNER: U. S. Engineer Office, Baltimore, Md.

PROJECT: Construction of Solomon Creek Pumping Station and appurtenant flood control work on southerly bank of Susquehanna River, North Branch, at mouth of Solomon Creek in Hanover Township, Luzerne County, Pa. Project involves diversion and care of water; construction of pumping station including entrance structure, discharge chamber, stilling basin and protective stone work; stop log structure and stop log storage box; widening and deepening existing creek channel; substation and power line; pumping units and electrical switchgear; sluice gates, flood gates, traveling crane and trash racks; power and lighting system; and remove, reconstruct and extend existing earth fill levee, including building of access road, gravel surfacing, and rock gutters.

CONDITIONS: Contractor to furnish all materials, and complete work in 300 calendar days. Rail and highway transportation facilities available. Wage rate minimums are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 60 to 85c.; and common, 65c.

BIDS: Three bids were received October 3, 1941, ranging from the contract low of $579,353 to $733,563. Awarded October 29.

LIST OF BIDDERS:

1. Sordoni Constr. Co., Forty Fort, Pa. (contract) $579,353
2. P. J. Carlin Constr. Co., New York, N. Y. 621,032
3. Thomas M. Flanaghan, Reading, Pa. 733,563

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Diversion and care of water	L. S.	$20,000.00	$29,000.00	$16,550.00
2. Excavation in borrow area	269,000 c. y.	.385	.35	.50
3. Stripping	18,600 c. y.	.33	.60	.40
4. Structure excavation, common	26,000 c. y.	.50	1.00	2.00
5. Structure excavation, rock	670 c. y.	5.00	10.00	5.00
6. Channel excavation, common	10,300 c. y.	.385	.60	.75
7. Backfill	6,600 c. y.	.385	.60	.75
8. Levee fill	250,000 c. y.	.025	.05	.17
9. Rolling additional trips	50,000 sq.	.005	.05	.06
10. Miscellaneous fill	1,600 c. y.	.35	.60	1.00
11. Gravel surfacing	1,400 c. y.	2.75	3.00	4.00
12. Seeding	11.5 ac.	200.00	300.00	200.00
13. Station enclosure	410 l. f.	5.00	4.00	4.50
14. Steel sheet piling	540 s. f.	3.00	1.00	2.00
15. Conc.-filled steel pipe piling	390 l. f.	7.50	4.00	6.50
16. Cr. stone backing, filters and drain.	870 c. y.	5.00	4.00	3.00
17. Riprap and rock gutters	1,440 c. y.	7.50	5.00	7.50
18. Derrick stone	110 c. y.	5.00	7.00	14.00
19. Concrete	5,150 c. y.	25.00	22.00	35.00
20. Steel, concrete reinforcement	764,000 lb.	.05	.07	.065
21. Pumping station superstructure	L. S.	25,000.00	24,000.00	20,000.00
22. Iron castings	2,200 lb.	.14	.15	.15
23. Misc. iron and steel	48,800 lb.	.12	.32	.13
24. Steel; trash racks	82,000 lb	.12	.32	.13
25. Pipe handrailing, chain guards	2,470 lb.	.40	.30	.27
26. Guard fence	450 l. f.	2.29	1.80	2.00
27. Overhead power line	L. S.	1,500.00	2,500.00	2,000.00
28. Substation, 2,000 KVA	L. S.	18,194.00	18,000.00	20,000.00
29. Power and lighting system	L. S.	5,060.00	7,000.00	5,500.00
30. Metalclad switchgear	L. S.	14,597.00	13,000.00	15,500.00
31. 70,000-gpm. motor driven pump. units	4 ea.	21,000.00	20,000.00	20,000.00
32. Traveling crane	1 ea.	5,000.00	2,200.00	2,000.00
33. Monorail hoist, ¼-ton	1 ea.	1,000.00	250.00	125.00
34. Gantry crane, 4-ton	1 ea.	5,000.00	1,500.00	2,650.00
35. Sluice gates, 12 x 10-ft., rectangular	4 ea.	10,000.00	5,000.00	5,800.00
36. Automatic flood gates, 66-in.	4 ea.	1,500.00	1,400.00	1,800.00
37. Stop log davits and sockets, 3½-in.	L. S.	250.00	220.00	325.00
38. As above, 3-in.	L. S.	200.00	80.00	125.00
39. Timber, white oak	2.1 Mbm.	150.00	260.00	225.00
40. Lifting beam for stop logs	1 ea.	200.00	220.00	130.00

ARSENAL WHARF BENICIA, CALIFORNIA

OWNER: U. S. Engineer Office, San Francisco, Calif.

PROJECT: Construction of reinforced concrete wharf located in Carquinez Straits at Benicia Arsenal, Benicia, Calif. Also involves construction of reinforced roadway approach on concrete piles, railway trestle approaches, roadway approach fill, structural steel warehouse, complete with roofing, siding, steel rolling doors, steel sash, doors, office and toilet partitions, plumbing, electrical installation, and finish painting.

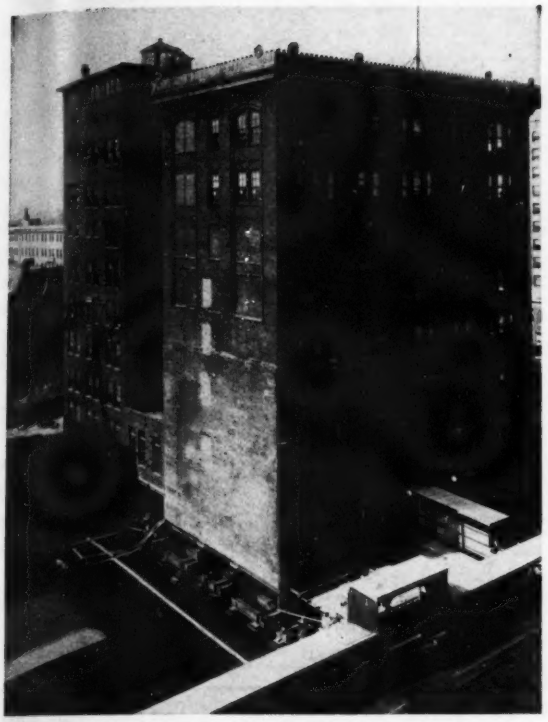
CONDITIONS: Contractor to furnish all materials and complete work in 270 working days. Highway and water transportation facilities available. Wage rates specified are: skilled labor, $1.10 to $1.75 per hr.; semi-skilled, 70c. to $1.25; and common labor, 75 to 90c.

BIDS: Five bids were opened June 2, 1941, ranging from the contract low of $631,238 to $704,286.

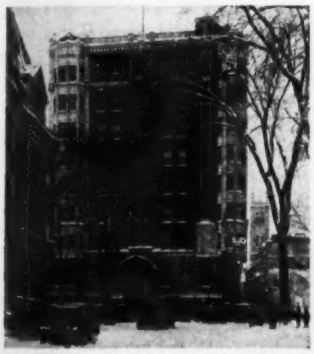
LIST OF BIDDERS:

1. Robert E. McKee, Los Angeles, Calif. (contract) $631,238
2. A. Soda & Son, Oakland, Calif. 647,715
3. Heafey-Moore, Frederickson & Watson, Oakland, Calif. 654,213
4. Tavares Constr. Co., Los Angeles, Calif. 677,700
5. H. Mayson, Los Angeles, Calif. 704,286

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Reinforcing steel	497,000 lb.	$0.052	$0.05	$0.052
2. Concrete	2,825 c. y.	21.00	29.00	27.00
3. Furn. 20-in. precast conc. piles	86,000 l. f.	2.84	2.50	2.90
4. Furn. 18-in. precast conc. piles	5,000 l. f.	2.54	2.20	2.80
5. Drive conc. vertical piles	1,112 ea.	75.00	70.00	80.00
6. Drive conc. batter piles	57 ea.	80.00	75.00	90.00
7. Underdeck waterproofing	55,000 s. f.	.055	.10	.04
8. Structural steel	115,000 lb.	.115	.11	.12
9. Roofing and siding (Alt. 1)	16,600 s. f.	.43	.70	.50
10. Roofing and siding (Alt. 2)	16,600 s. f.	.54	.65	.50
11. Steel sash	L. S.	375.00	750.00	425.00
12. Steel rolling doors	L. S.	4,200.00	4,900.00	4,700.00
13. Steel partitions	L. S.	1,450.00	1,450.00	1,350.00
14. Fire protec. sys. and plumbing equip.	L. S.	22,800.00	25,000.00	15,000.00
15. Electrical equipment	L. S.	11,300.00	12,500.00	11,500.00
16. Mooring bitts	4 ea.	140.00	150.00	133.00
17. Mooring cleats	6 ea.	68.00	70.00	80.00
18. Hardware	69,000 lb.	.15	.25	.145
19. Miscellaneous steel	33,000 lb.	.25	.25	.28
20. Platform hoist	L. S.	8,034.00	7,000.00	8,500.00
21. Asphalt surfacing	57,000 s. f.	.12	.10	.10
22. Finish painting	L. S.	2,000.00	2,000.00	2,400.00
23. Furn. treated timber piles	21,000 l. f.	1.31	1.10	1.30
24. Drive treated timber piles	316 ea.	33.00	40.00	28.00
25. Furn. eucalyptus piles	11,000 l. f.	.50	.55	.58
26. Drive eucalyptus piles	150 ea.	20.00	40.00	28.00
27. Floating log	475 l. f.	.65	1.00	1.20
28. Treated timber	51 M bm.	132.00	160.00	160.00
29. Untreated timber	170 M bm.	85.00	100.00	79.00
30. Railway trackwork	L. S.	13,650.00	15,000.00	13,900.00
31. Fill	14,000 c. y.	.50	1.00	.54
32. Riprap	2,300 ton	4.20	6.00	3.40
33. Asph. conc. road pavement	9,600 s. f.	.31	.10	.34



TELEPHONE BUILDING, Indianapolis — 8-story building; 100 feet x 135 feet, weight 12,000 tons. Moved 52 feet and turned 90 degrees. Telephone service, steam heat, water and sanitary services maintained. Three elevators operated during entire operation.

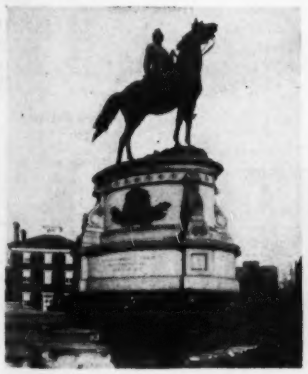


APARTMENT HOUSE, Albany, moving across street to new location.

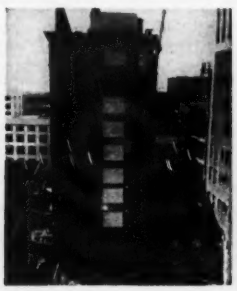
WATERTANK — moved to new foundation.

GARAGE, Youngstown—a $400,000 investment; 327' x 65', weighing 10,000 tons. Moved 27' for street widening. Normal functions were maintained throughout the operation.

STATUE takes a ride.



STORE, Hartford, 9-story building moved 112 feet.



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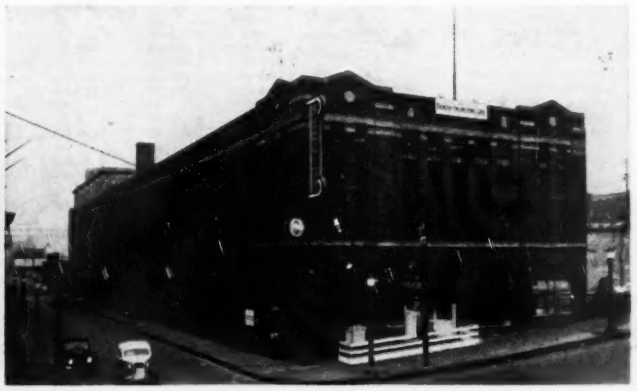

POWERHOUSE SUPERSTRUCTURE, SURGE TANKS, FORT PECK DAM

OWNER: U. S. Engineer Office, Kansas City, Mo. Harza Engineering Co., Chicago, consulting engineers.

PROJECT: Construction of powerhouse superstructure, penstocks, surge tanks, plate liner and shaft building at Control Shaft No. 1, at Fort Peck, approximately 20 miles southeast of Glasgow, Mont., including installation of turbines, governors and other equipment furnished under another contract. Powerhouse to be located within existing outlet structure for Fort Peck tunnels. Powerhouse superstructure and surge tank structure to be erected on substructure built by others. Area over penstocks and wye branch, between existing tunnel outlet and powerhouse to be covered by concrete slab and earth fill. Outside fenced substation to be built south of powerhouse and existing left outlet structure. Main control shaft building and a steel plate liner to be built at top and bottom, respectively, of existing control shaft. Powerhouse to contain one 50,000 hp. unit, one 20,000 hp. unit, and provision for an additional 50,000 hp. unit.

CONDITIONS: Government to furnish all cement (except white and special cements), sand, gravel, waterproofing and curing solutions, and water. Contractor to furnish remainder of material, and complete all work by June 30, 1944. An escalator clause provides for adjustment in prices for labor and material based on Bureau of Labor Statistics data on average hourly construction labor earnings, and wholesale material prices. Labor to be accepted as 30 percent of contract price; material, 40 percent. Extremes in temperatures may be encountered. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.00 to $1.20 per hr.; semi-skilled, 65 to 80c.; and common, 50 to 60c.

BIDS: Four bids were received December 12, 1941, ranging from the contract low of $3,407,026 to $3,790,400. Engineer's estimate, $3,011,766.

LIST OF BIDDERS:

1. Fegles Constr. Co., Ltd., Minneapolis, Minn. (contract) $3,407,026
2. O'Driscoll & Grove, Inc., New York, N. Y. 3,433,691
3. Woods Bros. Constr. Co., Omaha, Nebr. 3,457,020
4. Morrison-Knudsen Co., Inc., Little Rock, Ark. 3,790,400

Item	Quan.	Unit Prices (1)	(2)	(3)
1. General earth excavation	1,700 c.y.	$1.50	$0.62	$1.20
2. Trench and fndn. excav. (earth)	2,100 c.y.	2.50	.75	2.30
3. Excavation of shale	270 c.y.	4.50	31.00	5.40
4. Break and remove exist. concrete	370 c.y.	32.00	56.00	65.00
5. Place gravel backfill	2,270 c.y.	3.00	1.37	.70
6. Furn. and place plain backfill	41,000 c.y.	1.00	1.05	.90
7. Place gravel top course	L. S.	3,000.00	3,800.00	1,095.00
8. Furn. and place vitr. pipe drain tile	L. S.	1,090.00	1,100.00	1,860.00
9. Furn. and lay transformer transfer track	L. S.	10,000.00	5,900.00	5,968.00
10. Furn., install substation fence	L. S.	5,000.00	2,600.00	2,290.00
11. Place concrete floor finish	L. S.	3,000.00	9,800.00	6,236.00
12. Place ground concrete floor finish	L. S.	2,000.00	3,200.00	2,668.00
13. Furn. and apply floor hardener trtmt.	L. S.	2,000.00	750.00	1,634.00
14. Furn., place reinforcing steel	1,510,000 lb.	.096	.09	.08
15. Drill dowel bar holes; place bars	440 l. f.	5.00	2.00	.50
16. Copper water stops	L. S.	500.00	300.00	465.00
17. Joint filler	L. S.	2,000.00	7,400.00	866.00
18. Clay tiles for joist construction	L. S.	500.00	350.00	520.00
19. Concrete sidewalks	L. S.	800.00	500.00	1,820.00
20. Grout pipes and connections	200 lb.	3.00	.62	.50
21. Pressure grouting	100 c. f.	10.00	2.50	6.20
22. Mix and place plain grout	L. S.	1,000.00	1,800.00	620.00
23. Furn. and place metal reglets	L. S.	2,100.00	2,800.00	2,600.00
24. Class A concrete, powerhouse	15,740 c. y.	32.00	36.25	46.00
25. Class C concrete, powerhouse	10 c. y.	40.00	55.00	45.00
26. Class E concrete, powerhouse	17 c. y.	12.00	30.00	14.00
27. Membrane waterproofing	L. S.	5,500.00	6,800.00	6,000.00
28. Furn. and install damp-proofing	L. S.	700.00	900.00	770.00
29. Furn., erect structural steel	L. S.	142,000.00	114,000.00	173,152.00
30. Misc. steel and metalwork	L. S.	45,000.00	33,200.00	56,600.00
31. Furn., erect penstocks, surge tanks and tunnel lining, and install butterfly valves	L. S.	1,410,000.00	1,410,116.00	1,201,750.00
32. Furn., place ornamental metal work	L. S.	5,000.00	6,800.00	8,975.00
33. Furn., place doors and frames	L. S.	17,500.00	25,000.00	18,650.00
34. Furn., place tile furring and partitions	L. S.	5,600.00	8,000.00	8,676.00
35. Furn., place metal lath and plaster	L. S.	20,000.00	23,000.00	19,950.00
36. Furn., install spec. floor finish and wainscot	L. S.	16,000.00	18,000.00	14,340.00
37. Furn., install rough carpentry	L. S.	3,300.00	11,000.00	4,420.00
38. Furn., install caulking	L. S.	400.00	625.00	2,650.00
39. Furn., place 1-in. board insulation	L. S.	6,000.00	11,700.00	12,520.00
40. Furn., place built-up insulation	L. S.	5,100.00	6,200.00	2,235.00
41. Furn., install metal deck floor	L. S.	800.00	600.00	2,960.00
42. Steel lockers	L. S.	200.00	200.00	125.00
43. Glass block walls, glass, mirrors and shelves	L. S.	7,600.00	11,000.00	13,970.00
44. Asbestos cement partitions, doors and flues	L. S.	10,000.00	12,000.00	19,120.00
45. Furnish finish hardware	L. S.	2,600.00	3,800.00	3,880.00
46. Furnish roofs, roofing and copper metal work	L. S.	32,000.00	28,200.00	23,900.00
47. Furn., install cast stone surge tank housing	L. S.	75,000.00	68,000.00	89,000.00
48. Assemble, install turbines, governors	L. S.	24,000.00	11,400.00	13,000.00
49. Furn. and place hydraulic control boards, meters and gages	L. S.	5,100.00	5,000.00	9,250.00
50. Furn., erect powerhouse crane	L. S.	77,000.00	77,500.00	104,000.00
51. Furn., place 12-ton electr. hoist	L. S.	4,000.00	5,000.00	4,560.00
52. Furn., erect stop log gantry crane	L. S.	9,000.00	10,600.00	7,460.00
53. Furn. transformer transfer car	L. S.	2,000.00	1,000.00	1,125.00
54. Furn., install elevators	L. S.	30,000.00	31,200.00	25,730.00
55. Inst. transformer room crane	L. S.	2,000.00	3,100.00	3,044.00
56. Furn. and apply field paints	L. S.	15,000.00	31,200.00	4,690.00
57. Furn., install plumbing and piping	L. S.	112,000.00	150,000.00	131,970.00
58. Heating and ventilating system	L. S.	56,000.00	44,000.00	39,140.00
59. Furn., install electrical work	L. S.	441,500.00	380,277.00	420,926.00
60. Alterations to Main Control Shaft No. 1	L. S.	15,937.00	7,000.00	7,385.00
61. Buildings for Main Control Shaft No. 1	L. S.	50,000.00	48,800.00	48,580.00

PUMPING PLANT OREGON-CALIFORNIA

OWNER: Bureau of Reclamation, Modoc Unit, Tule Lake Division, Klamath Project, Oregon-California, Klamath Falls, Ore.

PROJECT: Construction of pumping plant "D", Modoc Unit, Tule Lake Division, Klamath Project. Work is located about 23 miles southeast of Klamath Falls, Ore. Pumping units, sump pump, priming pump, exposed pipe for pumps, electrical apparatus, and steel motor-support beams with sole plates in pumping plant to be furnished and installed by Government. All anchor bolts and embedded fastenings for anchoring apparatus will be placed by contractor when concrete is placed. All piping for plumbing system and all other embedded piping to be placed by contractor.

CONDITIONS: Contractor to furnish all form materials, except absorptive form lining; oil; wire, wire ties; all temporary supports; sawdust for nailing concrete; broken rock or gravel; water; waterproof covering for bonded concrete floor finish; and all other materials not part of completed structure needed for completion of contract. Railway transportation available to Tule Lake, and highway facilities available at site of work. Time for completion 150 calendar days. Wage rates specified as minimums are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 62½c. to $1.00; and common, 62½c.

BIDS: Four bids were opened August 25, 1941, ranging from the contract low of $37,232 to $67,826.

LIST OF BIDDERS:

1. John Gardner, Klamath Falls, Ore. $37,232
2. Scheumann & Johnson, Funella, Calif. 40,625
3. DeLuca & Sons, Inc., San Francisco, Calif. 61,219
4. River Bend Sand & Gravel Co., Salem, Ore. 67,826

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, common	2,800 c. y.	$1.00	$2.00	$1.12
2. Excavation, rock	500 c. y.	2.00	3.00	7.11
3. Backfill	1,800 c. y.	.50	.50	.51
4. Compacting backfill	650 c. y.	1.00	1.00	.77
5. Gravel bed for sew. disp. field	90 c. y.	3.00	5.00	7.43
6. Conc.; substruct. of pump house	410 c. y.	28.00	25.00	33.91
7. Conc.; superstruct. of pump house	130 c. y.	28.00	35.00	73.09
8. Conc.; except in pump house	300 c. y.	28.00	35.00	64.29
9. Placing reinforcement bars	121,000 lb.	.04	.02	.03
10. Construct control joints	65 l. f.	1.00	1.00	12.28
11. Place metal sealing strips	50 l. f.	.50	1.00	4.80
12. Place rubber water stops	500 l. f.	.50	.50	.72
13. Dampproofing walls of pump house	125 s. y.	1.00	1.00	2.64
14. Place bonded concrete floor finish	65 s. y.	2.00	1.00	46.7

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15. Place asphalt-saturated felt roofing, complete with flashing	900 s. f.	.20	.10	.23
16. Inst. wood door frames, doors and trim	190 s. f.	1.60	.50	1.79
17. Install metal sash windows	180 s. f.	1.00	.50	.43
18. Install metal louvers	100 s. f.	1.00	.50	.84
19. Lay 4-in. sewer pipe	100 l. f.	.40	.50	.50
20. Inst. trashrack and stop-log metal-work and stop-plank guides	9,000 lb.	.04	.03	.03
21. Inst. plate-steel discharge pipes	7,000 lb.	.04	.03	.04
22. Install flap gates	3,300 lb.	.04	.05	.03
23. Inst. traveling crane and crane rails	6,000 lb.	.04	.06	.04
24. Inst. metal floor plates, gratings, frames and hatchway, manholes, frames and covers	4,000 lb.	.04	.06	.06
25. Inst. metal pipe, fittings, valves; except pipe handrails	3,000 lb.	.04	.15	.19
26. Install miscel. metalwork	1,500 lb.	.20	.25	.46
27. Inst. electr. metal conduit, to 1-in	850 l. f.	.20	.50	.50
28. Inst. electr. met. conduit, 1 to 2-in	300 l. f.	.25	.50	.60
29. Inst. electr. non-metallic conduit	50 l. f.	.20	1.00	.10
30. Installing ground wires	600 lb.	.20	.30	.40

GARAGE, SHOP BUILDINGS, RESIDENCES ANDERSON RANCH DAM

OWNER: Bureau of Reclamation, Boise Project, Idaho.

PROJECT: Construction of combined garage and shop building, two six-room residences and nine four-room residences at the Government camp at Anderson Ranch Dam, Boise Project, Idaho. Camp site located along South Fork of Boise River, about 20 miles northeast of Mountain Home, Idaho.

CONDITIONS: Government to furnish cement; contractor to furnish all other materials and complete work in 150 calendar days. Rail transportation facilities available to Mountain Home, highway from there to dam site. Wage rates are: skilled labor, $1.12½ to $1.50 per hr.; semi-skilled, 75c. to $1.00; and common, 65c.

BIDS: Nine bids were opened February 24, 1942, ranging from the low of $66,579 to $104,722 for all schedules combined.

LIST OF BIDDERS:

1. R. D. Merrill Constr. Co., Helena, Mont. (low bidder) $66,579
2. Kloepfer & Cahoon, Boise, Idaho 71,330
3. Felix A. Plastino, Jerome, Idaho 71,953
4. Wade Bros. Co., Ogden, Utah 74,984
5. A. Ritchie & Co., Baker, Ore. 77,495
6. J. H. Wise & Son, Boise, Idaho 81,031
7. Vernon C. Tolboe, Provo, Utah 83,757
8. Whelchel, Park & Bunn, Caldwell, Idaho 92,178
9. S. C. Giles, Stockton, Calif. 104,722

Schedule No. 1

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, common	230 c. y.	$0.75	$0.70	$1.00
2. Excavation, rock	5 c. y.	5.00	10.00	5.00
3. Concrete in foundations	30 c. y.	7.50	10.00	14.00
4. Concrete in floors	55 c. y.	8.00	7.00	16.00
5. Combined garage and shop bldg., with conc. walls and weathered-black roof: 3 garage bays, 1 shop room	L. S.	6,531.85	4,946.00	5,912.50

Schedule No. 2

6. Excavation, common	1,800 c. y.	$0.75	$0.70	$1.00
7. Excavation, rock	10 c. y.	5.00	10.00	5.00
8. Concrete in foundations	150 c. y.	7.50	7.50	14.00
9. Concrete in floors	45 c. y.	8.00	7.00	16.00
10. Constr. 1 type 4 six-room residence, finished: wall shingles on outside walls: fire-place: dark-red roof	L. S.	5,575.00	6,500.00	5,800.00
11. Constr. 1 type 4 six-room residence, 4 rooms finished: Wilshire siding on outer walls: fireplace: olive-green roof	L. S.	5,575.00	6,200.00	5,800.00
12. Constr. 2 type 7 four-room residences, finished attic and fireplace: 1 with Wilshire siding and olive-green roof: other with wall shingles and weathered-black roof	L. S.	9,440.00	11,932.00	11,450.00
13. Constr. 1 type 7 four-room res., finished attic: wall shingles outside: dark-red roof: no fireplace	L. S.	4,295.00	5,766.00	5,560.00

Schedule No. 3

14. Excavation, common	1,200 c. y.	$0.75	$0.70	$1.00
15. Excavation, rock	10 c. y.	5.00	10.00	5.00
16. Concrete in foundation	150 c. y.	7.50	7.50	14.00
17. Concrete in floors	30 c. y.	8.00	7.00	16.00
18. Constr. 3 type 8-A, four-room residences, plywood siding: one with olive-green, one with dark-red, and one with weathered-black roof	L. S.	15,400.00	15,900.00	15,525.00
19. Constr. 3 type 11, four-room res., each with separate garage: one Wilshire and vertical siding, olive-green roof: one as above with dark-red roof: one with wall shingles and vertical siding and weathered-blk. roof	L. S.	13,700.00	14,115.00	11,850.00

CHEMICAL STORAGE BUILDING KANSAS CITY, MO.

OWNER: City of Kansas City, Mo.; Burns & McDonnell, Kansas City, engineers.

PROJECT: Construction of brick and reinforced concrete chemical building to provide space for storage of 200 tons of chemicals in connection with water softening plant in North Kansas City, Mo. Width 43 ft.; length 64 ft.; height 100 ft.

CONDITIONS: Contractor to furnish all material except structural steel and complete work for trial operation in 160 days. Final completion, 220 days. Rail, highway and water transportation available. Prevailing wages are: skilled labor, $1.25 to $1.50 per hr.; semi-skilled, $1.00; and common, 80c.

BIDS: Three bids were received July 1, 1941, ranging from the contract low of $250,000 to $282,000.

LIST OF BIDDERS:

1. S. Patti Constr. Co., Kansas City, Mo. (contract) $250,000
2. J. M. Jack Constr. Co., Kansas City, Kan. 269,000
3. Carrothers & Crouch Constr. Co., Kansas City, Mo 282,000

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Foundation piling	9,500 l. f.	$2.70	$2.50	$2.50
2. Piling cutoffs	500 l. f.	2.00	2.50	2.50
3. Class B concrete	375 c. y.	11.00	12.00	25.00
4. Class A concrete	—— c. y.	11.25	15.00	26.00
5. Reinforcing steel	—— lb.	.05	.06	.06

ORDNANCE DEPOT DOCK CHARLESTON, S. C.

OWNER: U. S. Engineer Office, Charleston, S. C.

PROJECT: Removal of remains of existing timber dock; construction of concrete shiploading dock; concrete loading platform; foundations, floor, roof, and general reconditioning of Dock Shed No. 1 (now existing); railroad approach to dock; at Charleston Ordnance Depot on westerly shore of Cooper River, 10 miles north of Charleston, S. C. Involves building new reinforced concrete dock, 1,000 by 46-ft. supported on precast concrete piles; approximately 1½ miles of railroad track; 1.1 miles of waterlines.

CONDITIONS: Contractor to furnish all materials and complete work in 280 days. Rail, highway and water transportation facilities available. Wage rates specified as minimums are: skilled labor, $1.00 to $1.25 per hr.; semi-skilled, 40 to 75c.; and common, 35c.

BIDS: Six bids were opened May 31, 1941, ranging from the contract low of $995,470 to $1,255,168.

LIST OF BIDDERS:

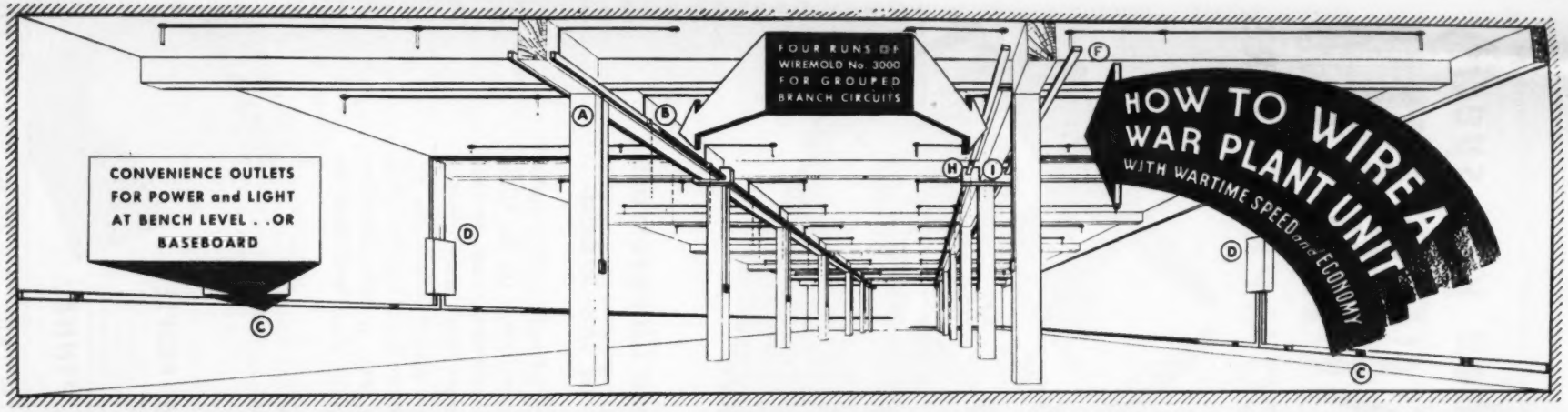
1. Espy Paving & Constr. Co., Savannah, Ga. $995,470
2. McWilliams Dredging Co., New Orleans, La. 1,001,517
3. Southeastern Engr. Corp., E. Jack Smith, Atlanta, Ga. 1,053,573
4. V. P. Loftis, Charlotte, N. C. 1,190,000
5. T. R. McMeekin, Cheraw; C. Y. Thomason Co., Greenville; Wannamaker & Wells, Inc., Orangeburg, S. C. 1,193,145
6. W. Horace Williams Co., New Orleans, La. 1,255,168

Part I—Remove Existing Dock

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Removal of existing dock	L.S.	$6,000.00	$10,000.00	$8,175.00

Part II—Construction of Dock

1. Concrete	3,754 c.y.	$30.35	$35.00	$33.00
2. Concrete piles	59,280 l.f.	4.57	3.70	5.25
3. Reinforcing steel	827,000 lb.	.06	.06	.058
4. Creosoted fender and dolphin piles	19,795 l.f.	1.60	1.75	1.60
5. Creosoted timber	12.2 Mbm.	145.00	250.00	170.00
6. Galvanized hardware	10,400 lb.	.15	.12	.30
7. Cast iron bits and cleats	25,000 lb.	.06	.15	.15
8. Track matl.; switches and rails	65 l.ton	100.00	70.00	145.00
9. Track matl.; track fastenings	57,260 lb.	.05	.06	.15
10. 6-in. c. i. pipe and fittings	1,000 l.f.	1.50	1.50	2.25
11. 2½-in. gate valves	10 ea.	25.00	30.00	22.50
12. Manhole frames and covers	10 ea.	25.00	120.00	25.00
13. Electrical installation	L.S.	5,000.00	4,500.00	5,500.00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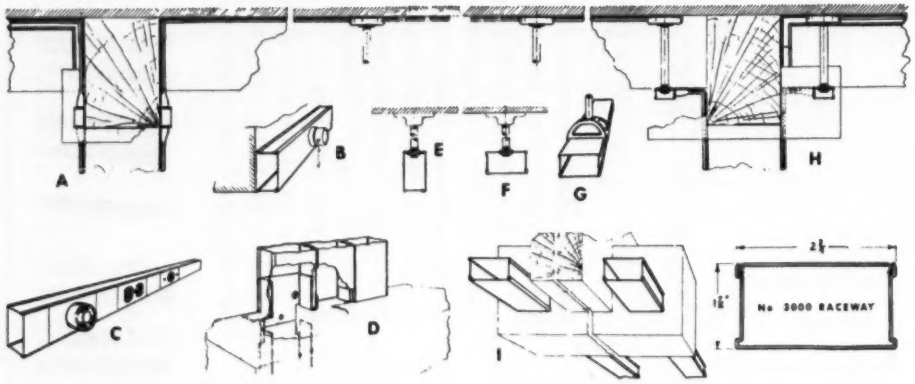

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Part III—Repair Existing Dock, Including Loading Platform				
1. Remove roof, floor, etc	L.S.	$6,000.00	$14,000.00	$4,500.00
2. Investigating foundations	L.S.	1,100.00	5,000.00	5,200.00
3. Concrete	600 c.y.	30.35	50.00	40.00
4. Reinforcing steel	153,600 lb.	.06	.06	.06
5. Roof trusses and purlins (struct. steel)	100,000 lb.	.08	.12	.15
6. Roof	L.S.	6,000.00	5,000.00	7,085.00
7. Miscellaneous repairs	L.S.	7,500.00	10,000.00	4,950.00
8. Creosoted piles	600 l.f.	2.00	2.60	3.00
Part IV—Railroad Construction				
1. Clearing and grubbing	10 ac.	$100.00	$200.00	$140.00
2. Excavation	5,000 c.y.	.25	.75	1.00
3. Reinforcing steel	175,000 lb.	.06	.06	.055
4. Concrete piles	13,195 l.f.	4.57	3.70	5.40
5. Creosoted piles	107,100 l.f.	1.50	1.40	1.35
6. Creosoted timber	686 Mbm.	145.00	167.00	127.50
7. Galvanized hardware	67,700 lb.	.15	.12	.15
8. Creosoted cross ties	68 M pcs.	145.00	100.00	90.00
9. Ballast	1,800 ton	5.00	3.50	5.00
10. Steel rail	192 l.ton	120.00	70.00	70.00
11. Track fastenings	204,200 lb.	.05	.06	.07
12. Salvaged rail	116 l.ton	50.00	30.00	25.00
13. Concrete	962 c.y.	30.35	45.00	33.00
Part V—Waterlines				
1. 6-in. c. i. pipe and fittings	5,700 l.f.	$1.50	$3.00	$2.00
2. 6-in. gate valves and boxes	2 ea.	40.00	600.00	50.00
3. Water meter and box	1 ea.	750.00	500.00	750.00
Part VI—Electric Transmission Lines				
1. Electric transmission line	L.S.	$4,000.00	$3,000.00	$3,500.00
Part VII				
1. Fire-water barrels and buckets	20 ea.	$25.00	$10.00	$10.00

RAILROAD AND TELEGRAPH LINE RELOCATION, IDAHO

OWNER: Bureau of Reclamation, Cascade Reservoir, Payette Division, Boise Project, Idaho; R. J. Newell, construction engineer, S. O. Harper, chief engineer.

PROJECT: Earthwork, structures, track, telegraph line and relocation of Idaho Northern branch of Oregon Short Line Railroad (Union Pacific Railroad Co., lessee) between Cascade and Donnelly, Idaho, Cascade Reservoir, Payette division, Boise Project, Idaho. Work located near Cascade. Actual connection between work under this contract and existing railroad track and telegraph line to be made by railroad and telegraph companies, respectively.

CONDITIONS: Government to furnish cement; corrugated metal pipe; timber piles; metal shoes; roofing-paper pile covers; timber for bridge, trestles, cattle guards, fences, road crossings; structural steel; red lead paste for bearing seats; ties, tie plugs, rails, angle bars, tie plates, rail anchors, switches, frogs, etc.; drain pipe; poles, brackets, insulators, wire, ground braces, etc.; material for right-of-way fences and cattle guards, paint and preservatives. Contractor to furnish balance of material and complete work in 230 calendar days. Rail and highway transportation facilities available, but access roads to actual site of work to be provided by contractor. Wage rates are: skilled labor, $1.00 to $1.25 per hr.; semi-skilled, 65 to 95c.; and common labor, 62½c.

BIDS: Eight bids were opened July 28, 1941, ranging from the contract low of $439,294 to $969,487.

LIST OF BIDDERS:

1. J. L. McLaughlin, Great Falls, Mont. (contract) $439,294
2. Morrison-Knudsen Co., Inc., Boise, Idaho 481,523
3. Max J. Kuney Co., Spokane, Wash. 486,728
4. Dan J. Cavanagh, Twin Falls, Idaho 519,565
5. Erickson Paving Co., and K. L. Goulter, Seattle, Wash 547,273
6. J. A. Terteling & Sons, Boise, Idaho 556,637
7. Hoops Constr. Co., Twin Falls, Idaho, and Tony Marrazzo, Boise, Idaho 742,414
8. McNutt Brothers, Eugene, Ore 969,487

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear right of way	150 ac.	$25.00	$20.00	$15.00
2. Grubbing right of way	50 ac.	25.00	20.00	15.00
3. Excavation; common, for roadway	402,000 c.y.	.15	.24	.20
4. Excavation; rock, for roadway	204,000 c.y.	.78	.84	.95
5. Overhaul	2,115,000 sta. c.y.	.005	.003	.01
6. Excav.; common, drain. channels and dikes	2,000 c.y.	.30	.30	.30
7. Excav.; rock, drain. channels and dikes	500 c.y.	2.00	1.50	1.00
8. Excav.; common, for structures	120 c.y.	1.00	2.00	3.00
9. Excav.; rock, for structures	1,460 c.y.	2.50	5.00	3.00
10. Rubble-masonry walls	120 c.y.	12.00	20.00	15.00
11. Dry rubble walls	120 c.y.	10.00	11.00	12.00
12. Riprap	57,000 c.y.	1.50	1.10	.80
13. Dry-rock paving	200 s.y.	3.00	2.00	3.00
14. Concrete in structures	660 c.y.	22.00	25.00	18.00
15. Place reinforcing bars	50,000 lb.	.025	.02	.03
16. Backfill	345 c.y.	.50	.60	1.00
17. Compacting backfill	345 c.y.	.50	.85	1.00
18. Lay 15-in. corr. metal pipe	1,650 l.f.	.50	.50	.60
19. Lay 18-in. corr. metal pipe	1,720 l.f.	.50	.60	.80
20. Lay 24-in. corr. metal pipe	510 l.f.	.50	.80	1.00
21. Lay 30-in. corr. metal pipe	740 l.f.	.60	1.00	1.20
22. Lay 36-in. corr. metal pipe	140 l.f.	.75	1.50	1.40
23. Lay 60-in. corr. metal pipe	360 l.f.	2.50	2.50	2.00
24. Lay 66-in. corr. metal pipe	150 l.f.	3.00	3.00	3.00
25. Driving timber piles	4,840 l.f.	.56	1.20	.70
26. Erect timber in bridge and trestles	90 Mbm.	17.50	35.00	30.00
27. Erect struct. steel in bridge	231,000 lb.	.025	.045	.03
28. Laying track	14.6 mi.	1,500.00	1,500.00	2,000.00
29. Apply rail anchors	8,500 ea.	.03	.10	.08
30. Construct turnout	4 ea.	300.00	200.00	300.00
31. Ballasting	26,000 c.y.	1.25	1.45	1.60
32. Constr. right-of-way fences	32 mi.	300.00	200.00	200.00
33. Install right-of-way fence gates	24 ea.	10.00	15.00	20.00
34. Construct cattle guards	24 ea.	10.00	25.00	40.00
35. Construct highway crossing	12 Mbm.	20.00	50.00	30.00
36. Construct telegraph line	10 mi.	200.00	300.00	500.00
37. Remove and salvage materials	L.S.	12,000.00	13,500.00	15,000.00

RAILWAY AND HIGHWAY RELOCATION, OREGON

OWNER: U. S. Engineer Office, Portland, Ore.

PROJECT: All work required for constructing roadbed and masonry for relocated Oregon Pacific & Eastern Railway between Stations 248+50 and 624+40.14; complete relocated Market Road No. 30 and relocated County Road No. 830, including public and private grade crossings, road approaches and right-of-way fences. Includes all clearing and grubbing, grading, bridges and culverts, highway surfacing, and right-of-way fences and gates. Site of work is in Lane County, Ore., about 6 miles southeast of Cottage Grove, in vicinity of proposed Dorena Flood Control Reservoir on Row River. Section I includes all work (except as noted) west of line normal to Sta. 369+00 on relocated railway; Section II, all work east of line noted.

CONDITIONS: Contractors to furnish all materials and complete both sections in 240 calendar days. Rail and highway transportation available. Wage rates are: skilled labor, $1.50 per hr.; semi-skilled, 75 to 90c.; and common, 62½c. Contractors to proceed with work in such a manner as not to interfere with others on project.

BIDS: Ten bids were opened on Section I May 28, 1941, ranging from the contract low of $142,906 to $181,783. Engineer's estimate, $155,738. An alternate was allowed for constructing new bridge, or moving and re-erecting existing bridge. Contract awarded on latter basis. Eight bids were received on the same day for Section II ranging from the contract low of $235,849 to $289,650. Engineer's estimate, $249,781.

Section I

LIST OF BIDDERS:

1. E. C. Hall Co., Eugene, Ore. (contract) $142,906
2. McNutt Bros., Eugene, Ore 144,347
3. J. C. Papin, Pendleton, Ore 147,300
4. Colonial Constr. Co., Spokane, Wash 149,702
5. Parker-Schram Co., Portland, Ore 164,893
6. White's Trucking Co., Walla Walla, Wash 174,161
7. Kuckenberg Constr. Co., Portland, Ore 175,648
8. Sam Orino, Portland, Ore 176,058
9. Natt McDougall Co., Portland, Ore 179,817
10. Hauser Constr. Co., Portland, Ore. 181,783

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	34 ac.	$500.00	$300.00	$220.00
2. Roadway excav., solid rock	122,000 c. y.	.55	.58	.62
3. Roadway excavation, common	112,000 c. y.	.25	.35	.28
4. Struct. excavation, solid rock	60 c. y.	6.00	3.00	5.00
5. Struct. excavation, common	280 c. y.	2.00	1.80	3.00
6. Water, for sprinkling	400 M gal.	1.50	1.25	2.00
7. Class A concrete	50 c. y.	30.00	26.00	26.00
8. Class B concrete	25 c. y.	30.00	25.00	26.00
9 Conc. reinforced steel	5,450 lb.	.08	.07	.07

10. Bridge timber, untreated	20.5 M bm.	70.00	60.00	77.00
11. Hardware and misc. metal	400 lb.	.20	.30	.20
12. Hand placed riprap	60 c. y.	5.00	5.00	4.00
13. Dumped riprap	50 c. y.	3.00	3.00	2.00
14. 12-in. culvert pipe	700 l. f.	1.30	1.40	1.25
15. 18-in. culvert pipe	700 l. f.	2.50	2.00	2.00
16. 24-in. culvert pipe	130 l. f.	3.50	3.20	3.00
17. 36-in. culvert pipe	110 l. f.	6.00	6.15	4.50
18. Tile sub-drain	500 l. f.	.75	1.00	1.00
19. Pit run gravel base	7,800 c. y.	1.00	.80	1.20
20. Leveling course, ¾ to 0-in.	950 c. y.	2.50	1.50	2.50
21. Mineral aggregate	275 c. y.	4.00	3.00	2.75
22. RC-3 asphalt	36 ton.	30.00	23.00	30.00
23. SC-6 road oil	24 ton	30.00	23.00	30.00
24. Move, re-erect bridge, Row River	L. S.	3,500.00	2,500.00	5,441.00
25. Right-of-way fence	1,710 rod	2.00	1.25	1.25
26. Right-of-way fence gates	8 ea.	30.00	25.00	20.00
27. Highway guard posts	100 ea.	2.50	3.00	3.00
28. Constr. new bridge (Alt. item 24)	L. S.	4,500.00	3,500.00	6,300.00

Section II

LIST OF BIDDERS:

1. McNutt Bros., Eugene, Ore. (contract) $235,849
2. E. C. Hall Co., Eugene, Ore 245,584
3. Colonial Constr. Co., Spokane, Wash 246,897
4. Parker-Schram Co., Portland, Ore. 261,010
5. Sam Orino, Portland, Ore 263,073
6. White's Trucking Co., Walla Walla, Wash 271,695
7. Kuckenberg Constr. Co., Portland, Ore 281,894
8. Natt McDougall Co., Portland, Ore 289,650

		Unit Prices		
Item	Quan.	(1)	(2)	(3)
1. Clearing and grubbing	90 ac.	$280.00	$500.00	$400.00
2. Roadway excavation, solid rock	156,000 c. y.	.53	.55	.65
3. Roadway excavation, common	242,000 c. y.	.35	.25	.25
4. Struct. excav., solid rock	50 c. y.	3.00	6.00	3.00
5. Struct. excav., common	550 c. y.	1.50	2.00	1.50
6. Water for sprinkling	675 M gal.	1.00	1.50	2.00
7. Class B concrete	21 c. y.	26.00	30.00	30.00
8. Timber piles	400 l. f.	1.00	1.25	1.25
9. Bridge timber, untreated	36 M bm.	60.00	75.00	90.00
10. Bridge timber, creosoted	19 M bm.	95.00	125.00	125.00
11. Hardware and misc. metal	4,300 lb.	.20	.20	.25
12. Hand placed riprap	60 c. y.	5.00	6.00	3.50
13. Dumped riprap	50 c. y.	3.00	3.00	2.00
14. 12-in. culvert pipe	1,170 l. f.	1.40	1.30	1.60
15. 18-in. culvert pipe	1,110 l. f.	2.00	2.50	2.00
16. 24-in. culvert pipe	530 l. f.	3.20	3.50	3.00
17. 30-in. culvert pipe	440 l. f.	4.05	6.50	4.00
18. 42-in. culvert pipe	360 l. f.	7.15	9.00	7.00
19. Tile sub-drain	500 l. f.	1.00	.75	.75
20. Pit run gravel base	12,300 c. y.	.80	1.00	1.00
21. Leveling course, ¾ to 0-in.	3,100 c. y.	1.50	2.00	1.50
22. Mineral aggregate	1,200 c. y.	3.00	3.00	2.50
23. RC-3 asphalt	112 ton	23.00	30.00	23.00
24. SC-6 road oil	73 ton	23.00	30.00	23.00
25. Right-of-way fence	1,770 rod	1.25	2.00	2.00
26. Right-of-way fence gates	14 ea.	25.00	30.00	35.00
27. Highway guard posts	50 ea.	3.00	2.50	2.00

RAILROAD ROADBED AND TUNNELS, ALASKA

OWNER: U. S. Engineer Office, Seattle, Wash.

PROJECT: Construction of 11.2 miles of roadbed and two tunnels for Passage Canal Connection of the Alaska Railroad located about midway between Seward and Anchorage, Alaska. Length of project is from head of Passage Canal in Prince William Sound to Turnagain arm of Cook Inlet.

CONDITIONS: Contractor to furnish all materials and complete work in 450 calendar days. The two tunnels are to be driven through solid rock. Rail, highway and water transportation facilities available to vicinity of work, but contractor must build road to first tunnel site, and provide necessary housing for workmen. Materials will probably be landed in barges, then carried by railway or local highways to site of work. Wage rates stipulated are: skilled labor, $1.50 per hr.; semi-skilled, $1.20; and common, 90c. per hr.

BIDS: Two bids were opened May 12, 1941, the low of $4,074,616, and $4,267,435. Engineer's estimate $2,962,157.

LIST OF BIDDERS:

1. Seaboard Construction Corp., Mount Kisco, N. Y. ... $4,074,616
2. Morrison-Knudsen Co., Boise, Idaho; General Constr. Co., Seattle, Wash.; J. F. Shea & Co., Inc., Portland, Ore. 4,267,435

		Unit Prices		
Item	Quan.	(1)	(2)	(3)*
1. Clearing	200 ac.	$100.00	$300.00	$120.00
2. Solid rock excavation	200,000 c. y.	2.85	1.80	1.50
3. Loose rock excavation	20,000 c. y.	.50	1.40	.55
4. Common excavation	100,000 c. y.	.20	.50	.35
5. Wet excavation	100 c. y.	5.00	10.00	6.00
6. Solid rock borrow	500 c. y.	2.50	1.75	1.50
7. Common borrow	100,000 c. y.	.50	.90	.50
8. Tunnel excavation	246,000 c. y.	12.765	13.50	9.45
9. Overhaul A	350,000 sta. y.	.02	.01	.015
10. Overhaul B	3,000,000 sta. y.	.01	.01	.007
11. Overhaul C	3,500,000 sta. y.	.007	.02	.005
12. Timber bridge piling, below cutoff	8,700 l. f.	1.25	2.20	.60
13. Timber bridge piling above cutoff	2,600 l. f.	1.00	.50	.30
14. Metal pile shoes in place	50 ea.	10.00	5.00	1.70
15. Bridge timber in place	145 M bm.	125.00	160.00	95.00
16. Tunnel timber in place	1,200 M bm.	108.00	75.00	100.00
17. Portal timber in place	240 M bm.	120.00	160.00	80.00
18. Culvert timber in place	5 M bm.	140.00	160.00	70.00
19. 30-in. 14-ga. corr. galv. iron pipe	116 l. f.	5.00	7.00	5.80
20. 36-in. 14-ga. corr. galv. iron pipe	206 l. f.	6.00	8.00	6.50
21. 42-in. 10-ga. corr. galv. iron pipe	112 l. f.	11.00	14.00	12.40
22. 48-in. 10-ga. corr. galv. iron pipe	96 l. f.	13.00	17.00	14.60
23. 48-in. 12-ga. corr. galv. iron pipe	80 l. f.	12.00	15.00	11.75
24. 60-in. 8-ga. corr. galv. iron pipe	236 l. f.	20.00	22.50	22.30

*Engineer's estimate.

ANDERSON RANCH DAM AND POWER PLANT, IDAHO

OWNER: Bureau of Reclamation, Boise, Idaho.

PROJECT: Construction of Anderson Ranch Dam, an earth dam across South Fork of Boise River; outlet works through left abutment; and open-channel spillway at left abutment. Dam approximately 1,350-ft. long, maximum height 330-ft. above river bed. Main body of dam to be of moistened and rolled embankment of clay, sand and gravel. Power plant, on left bank at downstream toe of dam, to be of reinforced concrete construction, 70x104-ft., and will house two main generating units and station service equipment. (Spec. No. 965.)

CONDITIONS: Contractor to furnish sand; gravel; rock; rock spalls; structural steel supports, steel lagging, and steel tunnel-liner plates; lumber for temporary tunnel timbering; form materials, except absorptive form lining; oil; wire, wire ties; temporary supports; nails; lumber for permanent wood inserts; water; calking material; wood stops; and all materials required for temporary construction in completing this contract. Government to furnish balance of materials. All work to be completed within 1,670 calendar days. Railroad transportation available to Mountain Home, Idaho, about 20 miles from damsite. Highway available for trucking to site. Minimum wage rates are: skilled labor, 95c. to $1.25 per hr.; semi-skilled, 62½ to 90c.; common, 62½ to 70c.

BIDS: Three bids were received July 7, 1941 ranging from the contract low of $9,986,203 to $14,367,896.

LIST OF BIDDERS:

1. Morrison-Knudsen Co., Inc., Boise, Idaho; J. F. Shea Co., Inc., Los Angeles, Calif.; Ford J. Twaits Co., Los Angeles; Winston Bros. Co., Los Angeles. ... $9,986,203
2. W. E. Callahan Constr. Co., Los Angeles, Calif.; Gunther & Shirley Co., Los Angeles, Calif.; Peter Kiewit Sons' Co., Omaha; Nebr.; George W. Condon Co., Omaha, Nebr. 11,816,670
3. Guy F. Atkinson Co., San Francisco, Calif.; George Pollock Co., Sacramento, Calif. 14,367,896

		Unit Prices		
Item	Quan.	(1)	(2)	(3)
1. Diversion, care of river, unwater fndn	L. S.	$117,000.00	$25,000.00	$50,000.00
2. Excav., strip sand and grav. deposit	10,000 c. y.	.23	.25	.35
3. Excav., strip borrow pits	700,000 c. y.	.25	.15	.15
4. Excav., common; spillway above El. 4205.5 and road and parking areas	40,000 c. y.	.90	2.00	3.00
5. Rock excav., as above	225,000 c. y.	.90	2.00	3.00
6. Excav., com.; inlet to outlet wks.	5,000 c. y.	5.00	2.00	6.00
7. Excav., rock; as above	35,000 c. y.	5.00	2.00	6.00
8. Excav., common; outlet to outlet wks., spillway, power plant, below El. 4,205.5 and above El. 3885	200,000 c. y.	.90	2.00	3.00
9. Excav., rock; as above	500,000 c. y.	.90	2.00	3.00
10. Excav., common; spillway, outlet to outlet wks., power plant, below El. 3,885	75,000 c. y.	1.20	2.00	4.00
11. Excav., rock; as above	100,000 c. y.	1.20	2.00	4.00
12. Excavation, all classes, in tunnel	27,000 c. y.	18.00	30.00	15.00
13. Perm. struct. st. tun supports	100,000 lb.	.115	.25	.14
14. Steel tunnel-liner plates; steel lagging	100,000 lb.	.115	.10	.14
15. Excav., all classes; fndn. of dam	1,800,000 c. y.	.65	.70	1.50
16. Excav., common; embank. toe drains	1,100 c. y.	1.10	20.00	4.00

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17. Excav., rock; embank. toe drains	1,100 c. y.	5.70	20.00	7.00
18. Excav., all classes; cut-off wall footings	2,300 c. y.	14.00	20.00	18.00
19. Excavation of concrete	250 c. y.	14.00	20.00	20.00
20. Backfill	10,000 c. y.	.90	1.50	1.25
21. Road and parking area surfacing	6,000 c. y.	2.25	2.00	3.00
22. Rubble-masonry wall	300 c. y.	17.00	30.00	15.00
23. Excav., Wilson Flat borrow pit, transport to dam embank	3,700,000 c. y.	.40	.36	.48
24. Excav., Whipple borrow pit; trans	1,800,000 c. y.	.35	.38	.40
25. Excav., Camas Creek borrow pit	140,000 c. y.	.50	.41	.43
26. Excav., Two Mile borrow pit, etc	1,500,000 c. y.	.43	.39	.42
27. Excav., Anderson Ranch borrow pit	1,800,000 c. y.	.51	.41	.40
28. Earth fill, embankment	7,500,000 c. y.	.10	.17	.15
29. Sand and gravel filter blanket; rock fill, downstream embank. slope	110,000 c. y.	.35	.55	.15
30. Cobble and rock fill, downstream slope of embank	1,900,000 c. y.	.27	.24	.15
31. Riprap, upstream embank. slope	90,000 c. y.	.46	.50	1.25
32. Dumped riprap in spillway chan.	3,000 c. y.	1.10	1.00	1.25
33. 4-in. sew. pipe drains, unocm. joints, embedded in gravel	3,000 l. f.	2.25	2.00	.75
34. 4-in. as above, embed. in porous conc	2,850 l. f.	4.50	3.00	2.50
35. 6-in. pipe, as in item 33	2,500 l. f.	2.75	2.00	1.00
36. 8-in. pipe, as in item 33	4,700 l. f.	3.40	3.00	1.25
37. 12-in. sew. pipe, cemented joints	200 l. f.	6.00	2.00	1.50
38. Porous conc. under spillway gate	50 c. y.	24.00	25.00	25.00
39. Drill weep holes	1,500 l. f.	.65	2.50	1.25
40. Drill line holes for rock excav	80,000 l. f.	.57	.60	.60
41. Core drill 5½-in. holes to 30-ft	1,000 l. f.	4.80	15.00	10.00
42. Drill 1¾-in. grout holes, to 30-ft.	34,000 l. f.	1.25	2.50	1.75
43. As above, 30 to 50-ft	11,000 l. f.	1.50	2.50	2.50
44. As above, 50 to 100-ft	10,000 l. f.	1.80	2.50	2.50
45. As above, 100 to 150-ft	4,000 l. f.	2.30	2.50	3.00
46. Place grout pipe and fittings	20,000 lb.	.17	.30	.25
47. Pressure grouting	75,000 c. f.	1.40	1.50	2.00
48. Pressure grouting with packers	10,000 c. f.	1.70	2.00	2.50
49. Drill holes for anchor bars and grouting bars in place	17,000 l. f.	.70	1.00	1.00
50. Conc. in embank. footings, cut-off walls	2,300 c. y.	11.50	30.00	12.00
51. Conc.; embank. cut-off walls, except footings	1,500 c. y.	26.00	30.00	27.00
52. Conc.; inlet struct. of outlet works, except trashrack beams and girders	3,700 c. y.	27.00	20.00	22.00
53. Conc. in trashrack beams and girders	900 c. y.	45.00	25.00	60.00
54. Concrete in gate hoist house	150 c. y.	34.00	40.00	50.00
55. Concrete in tunnel lining	7,700 c. y.	24.00	40.00	20.00
56. Conc. in spillway floors; outlet wks.; paving about powerhouse, outlet struct	8,500 c. y.	13.50	15.00	15.00
57. Conc. in spillway gate structure	1,000 c. y.	22.50	30.00	22.00
58. Conc. lining of spillway and outlet wks., except floors	5,000 c. y.	20.00	20.00	21.00
59. Concrete in gravity walls	1,700 c. y.	13.50	15.00	12.50
60. Conc., in outlet struc., except floor, side walls below 1,3,885, beams, deck and second-stage concrete	8,500 c. y.	21.00	20.00	20.00
61. Conc.; beam, deck, outlet str	1,800 c. y.	29.00	30.00	22.00
62. Second-stage conc. in outlet wks	5,600 c. y.	11.00	10.00	10.00
63. Conc. in tunnel access structure	70 c. y.	27.00	50.00	70.00
64. Conc. in powerhouse substructure	2,300 c. y.	17.00	25.00	16.00
65. Conc. in powerhouse superstr	1,550 c. y.	36.00	25.00	60.00
66. Second-stage conc. in powerhouse	1,000 c. y.	16.00	15.00	18.00
67. Conc. in parapet and curb walls	600 c. y.	34.00	15.00	25.00
68. Place reinforcement bars	4,700,000 lb.	.02	.03	.025
69. Place metal sealing strips	1,850 l. f.	.60	2.00	1.00
70. Place rubber water stops	1,000 l. f.	.80	2.00	1.00
71. Place elastic joint filler	2,500 s. f.	.25	1.00	.75
72. Construct control joints	175 l. f.	1.20	2.00	2.00
73. Place rubber sleeves on rein. bars	1,250 l. f.	.20	2.00	.75
74. Insulate rein. bars and elec. metal cond	1,000 ea.	.60	2.00	.75
75. Place asph.-saturated roofing	7,300 s. f.	.40	.50	.25
76. Construct glass block panels	660 s. f.	1.80	4.00	1.00
77. Place membrane waterproofing	100 s. f.	.60	1.00	.50
78. Place cork ceilings	1,750 s. f.	.50	.50	.50
79. Install radial gates	86,000 lb.	.04	.025	.05
80. Inst. bulkhead-gate frame and track; trashrack-rake & needle-beam guides	135,000 lb.	.035	.015	.10
81. Inst. blkhd.-gate, trashrack rake	240,000 lb.	.035	.035	.05
82. Install trashracks	600,000 lb.	.018	.015	.03
83. Erect str. steel roof framing and hoist head frame	186,000 lb.	.035	.03	.03
84. Inst. gate and trashrack-rake hoists	92,000 lb.	.05	.03	.03
85. Install traveling cranes	146,000 lb.	.035	.015	.03
86. Inst. crane runway and transtrack rails	56,000 lb.	.03	.015	.03
87. Inst. std. pipe, fittings, pipe, valves, under 6-in.	27,500 lb.	.10	.20	.15
88. As above, 6-in. or over	39,000 lb.	.05	.15	.10
89. Install pipe handrails	5,200 lb.	.12	.40	.20
90. Waterproofing outside walls	135 s. y.	.60	4.00	1.00
91. Lightweight conc. in floors	15 c. y.	30.00	50.00	30.00
92. Inst. met. frames for hatchways, manholes, floor plates, grating	13,000 lb.	.06	.20	.10
93. Inst. met. pier noses, armor angles	8,500 lb.	.06	.20	.10
94. Inst. metal accordion doors	1,020 s. f.	.50	3.00	.60
95. Inst. metal swinging doors	260 s. f.	.50	3.00	.60
96. Inst. metal sash windows	650 s. f.	1.10	3.00	.60
97. Inst. met. louvers, exhaust fans	1,200 lb.	.25	.50	.20
98. Const. flex. steel-plate guardrails	500 l. f.	1.20	2.00	1.00
99. Inst. miscellaneous metalwork	7,000 lb.	.10	.60	.25
100. Inst. embedded elec. met. conduit, under 1¼-in. dia	10,000 l. f.	.50	.60	.50
101. As above, 1¼ to 3-in	16,000 l. f.	.50	.80	.60
102. Inst. embedded elec. non-met. conduit	2,000 l. f.	.35	.60	.60
103. Inst. ground wires, grnd. rods	1,500 lb.	.25	.80	.30
104. Transport all freight for gov't., between Mountain Home, Idaho and dam site. (not constructor's frt.)	1,500 ton	4.80	15.00	6.00

WOLF CREEK DAM
KENTUCKY

OWNER: U.S. Engineer Office, Nashville, Tenn.; Major O. E. Walsh, district engineer.

PROJECT: Construction of Wolf Creek Dam, a combination concrete and earth structure on Cumberland River in Russell County, Ky., about 10 miles southwest of Jamestown, and 12 miles north of Albany, Ky. Major items include: cofferdam for earth embankment and masonry sections; foundation work, excavation, foundation drilling and grouting; earth embankment; concrete masonry for dam, pylon, spillway bridge, spray, training and retaining walls, piers, etc.; slide gates and operating equipment; tainter gate embedded metal; penstocks; temporary buildings; and other miscellaneous items. Constructed to provide flood control for Cumberland Valley, and to generate electric power.

CONDITIONS: Government to furnish cement; tainter gates and gate operating machinery to be furnished and erected by government. Contractor to furnish all other materials and complete work in 1,200 calendar days. There is no railway in immediate vicinity of work, but Southern Ry. passes through Burnside and Somerset, and Oneida & Western RR. terminates and has sidings at Jamestown, Ky. State Route 35 passes within four miles of dam site, and connecting gravel road passes near right abutment of dam. Government to recondition part of an existing road and construct new section to terminate near left dam abutment. Minimum wage rates are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 45 to 90c.; and common, 40 to 50c.

BIDS: Two bids were received July 8, 1941, the contract low of $15,803,690, and $16,535,774. Engineer's estimate, $14,868,791.

LIST OF BIDDERS:

1. S. A. Healy Co., White Plains, N. Y. (contract) . . . $15,803,690
2. United Constr. Co., and Porter-DeWitt Constr. Co., Winona, Minn. 16,535,774

		Unit Prices		
Item	Quan.	(1)	(2)	(3)*
1. Cofferdams	L.S.	$300,000.00	$138,004.00	$246,646.71
2. Excavation, stripping	250,000 c.y.	.20	.20	.27
3. Excavation, common	1,700,000 c.y.	.26	2.31	.33
4. Excavation, rock	70,000 c.y.	.90	6.42	.97
5. Line drilling	28,000 s.f.	.60	.96	.74
6. Excav., borrow area "A"	4,900,000 c.y.	.26	.23	.28
7. Excav., borrow area "B"	3,500,000 c.y.	.26	.23	.28
8. Excav., borrow area "C"	1,150,000 c.y.	.30	.24	.32
9. Overburden relief holes	1,600 l.f.	2.00	2.89	1.92
10. Drill 2-in. grout holes, under embk	22,000 l.f.	2.50	2.00	1.78
11. Drill 2-in. grout holes under masry	30,000 l.f.	2.75	2.00	2.08
12. Drill 4-in. drain holes	7,440 l.f.	5.00	3.10	3.58
13. Drill 3-in. drain holes	2,300 l.f.	2.00	.54	.63
14. Drill 3-in. anchor holes	7,300 l.f.	2.00	.86	.84
15. Drill 6-in. core holes	200 l.f.	10.00	9.63	6.81
16. Press. grouting under embank	22,000 sack	1.50	1.00	1.00
17. Pressure grouting under masonry	45,000 sack	1.50	1.00	1.00
18. Impervious rolled fill	8,600,000 c.y.	.05	.07	.09
19. Random fill	570,000 c.y.	.22	.[illegible]	.09
20. Backfill	20,000 c.y.	.25	.66	.54
21. Roll, each add'l. two trips	2,000,000 sq.	.01	.007	.02
22. Gravel drains	500 c.y.	2.00	6.21	1.14
23. Sand and gravel	160,000 c.y.	.70	1.50	.93
24. Dumped riprap	150,000 c.y.	.80	2.25	1.91
25. Rock paving	13,000 c.y.	15.00	10.50	3.68
26. Rock fill	22,000 c.y.	3.00	2.00	1.91
27. Stone masonry	800 c.y.	25.00	10.50	7.07
28. Slush mortar	200 c.y.	6.50	15.00	8.00
29. 12-in. vit. tile, half round	3,100 l.f.	1.80	1.80	.51
30. Seeding	46 ac.	150.00	150.00	345.24
31. Roadway base	10,300 s.y.	3.00	.75	.61
32. Roadway guard rail	7,740 l.f.	2.50	1.50	1.40
33. 15-in. corr. met. pipe, fndn. drain.	2,800 l.f.	3.00	1.70	2.01
34. 15-in. corr. metal pipe	1,330 l.f.	3.00	2.75	1.92
35. 18-in. corr. metal pipe	1,020 l.f.	4.00	3.00	2.17
36. 21-in. corr. metal pipe	2,120 l.f.	4.50	3.75	2.49
37. Catch basins, complete	34 ea.	150.00	115.00	96.47
38. Haul and store cement	1,400,000 bbl.	.65	.45	.96
39. Concrete for dam	1,200,000 c.y.	6.72	5.00	5.66
40. Conc.; piers and spray wall	15,300 c.y.	25.00	12.00	12.44
41. Conc.; training and ret. walls	24,000 c.y.	12.50	12.00	9.31
42. Concrete for bridge	700 c.y.	30.00	25.00	28.01
43. Miscellaneous concrete	3,300 c.y.	35.00	15.00	27.13

"A Mouthful at Every Bite"

Fully Reeved and with Heavy Counterweight. Digging material packed thru thousands of years

HEAVY COUNTERWEIGHT

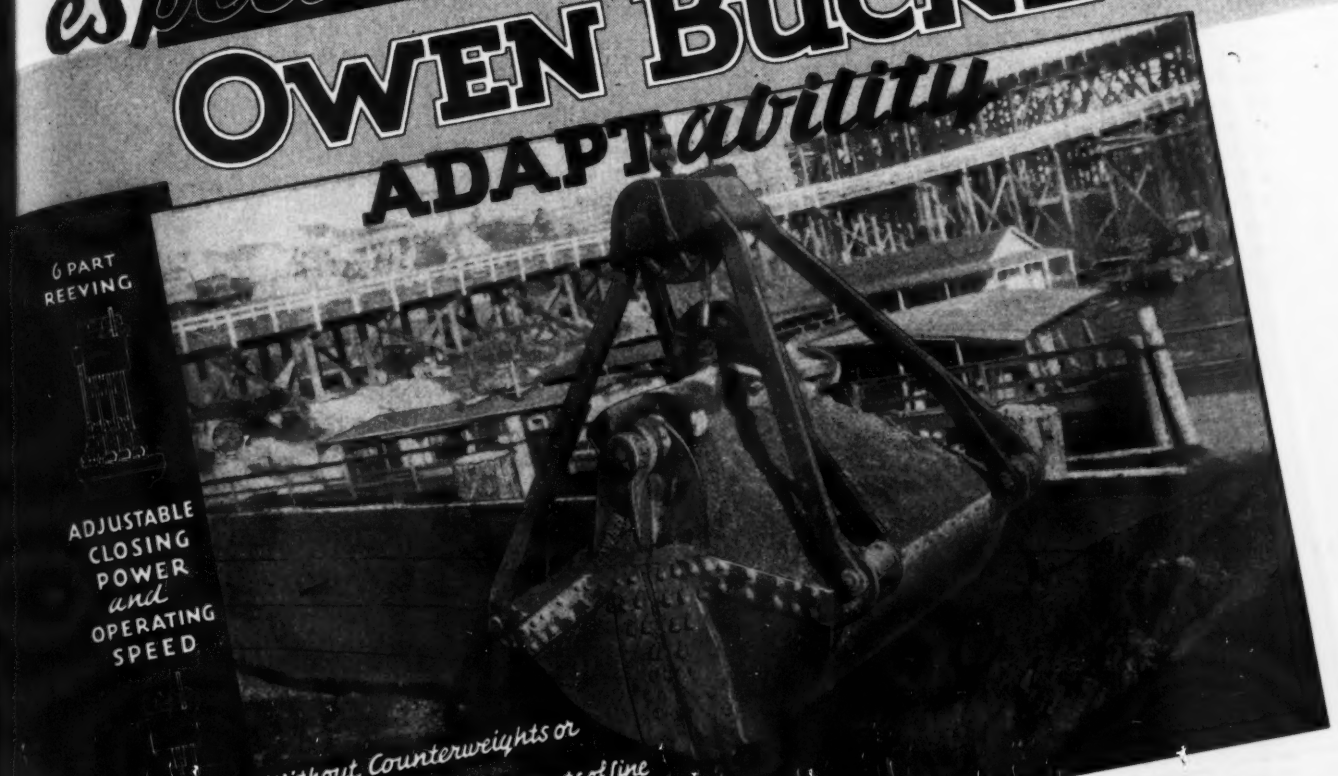
COUNTERWEIGHTS TO AID IN Closely Adapting DIGGING POWER to the work

STANDARD COUNTERWEIGHT

especially timely is

OWEN BUCKET

ADAPTability



6 PART REEVING

ADJUSTABLE CLOSING POWER and OPERATING SPEED

3 PART REEVING

Without Counterweights or Teeth, and with only 3 Parts of Line —for fast action in easy digging material

When buckets are scarce each unit may be required to handle various kinds of work. Under this demand OWEN BUCKET adaptability will prove to be particularly valuable.

The closing power and digging ability of each unit are adaptable, if desired, to dredging, excavating or material handling jobs.

The Owen Bucket C

6010 Breakwater Ave. • Cleveland, O

BRANCHES:

NEW YORK **CHICAG**

PHILADELPHIA **BERKELEY, CA**

44. Control house	L.S.	30,000.00	12,000.00	11,346.82
45. Reinforcing steel	2,800,000 lb.	.05	.02	.02
46. Porous concrete pipe	41,000 l.f.	.60	.75	.40
47. Copper stops	30,000 lb.	.60	.30	.13
48. Slide gates complete	L.S.	125,000.00	30,000.00	47,080.87
49. Oil pumps and piping system	L.S.	5,000.00	4,000.00	3,554.91
50. Sluice blkhd. and pickup beam	L.S.	2,500.00	2,900.00	2,232.51
51. Tainter gate embedded metal	L.S.	50,000.00	52,000.00	169,248.36
52. Penstocks	2,500,000 lb.	.14	.17	.10
53. Structural steel	670,000 lb.	.085	.07	.06
54. Misc. metal work	330,000 lb.	.16	.20	.20
55. Misc. cast iron	73,000 lb.	.07	.05	.04
56. Misc. wrought iron	136,000 lb.	.20	.12	.17
57. Misc. brass and bronze	4,600 lb.	1.00	.20	.25
58. Handrailing	24,000 lb.	.30	.09	.06
59. Black steel pipe	200,000 lb.	.20	.10	.06
60. Misc. corr. metal pipe	19,600 lb.	.20	.12	.14
61. Sump pumping system	L.S.	4,500.00	2,100.00	1,724.69
62. Water supply system	L.S.	5,000.00	3,000.00	2,704.93
63. Grouting gallery water system	L.S.	2,000.00	2,957.00	1,055.55
64. Bypass system	L.S.	4,000.00	3,700.00	3,145.74
65. Floatwell piping	L.S.	2,000.00	266.00	136.63
66. Pylon plumbing and drain. sys.	L.S.	6,000.00	7,000.00	1,932.13
67. Piezometer system	L.S.	3,000.00	3,277.00	982.58
68. Elevator	L.S.	17,500.00	15,000.00	15,470.01
69. Gasoline-electric stand-by unit	L.S.	5,000.00	4,000.00	4,588.13
70. Power and lighting system	L.S.	60,000.00	30,000.00	45,459.57
71. Conduits for electric wiring	L.S.	40,000.00	25,000.00	39,454.98
72. Tile gages	L.S.	1,500.00	2,000.00	1,463.53
73. Temporary buildings	L.S.	28,500.00	20,000.00	29,000.00

* *Engineer's estimate.*

SPILLWAY AND EMBANKMENT BLUE MOUNTAIN DAM, ARK.

OWNER: U. S. Engineer Office, Little Rock, Ark.

PROJECT: Constructing a rolled-fill earth dam, concrete spillway, and rolled-fill earth dikes, located on the Petit Jean River, near Waveland, Ark. Earth dam to be approximately 2,800-ft. long with average height above valley floor of 80-ft. Concrete-lined spillway in low saddle in left abutment. Wing dikes connecting spillway to dam and higher ground on each side.

CONDITIONS: Contractor to furnish all materials and complete work in 700 calendar days. Rail and highway transportation facilities are available. Work to be carried on without interference to contractors on other jobs under way. Absorptive form lining to be used on wooden forms on exterior and exposed concrete surfaces. Wage rates specified are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 40 to 75c.; and common labor, 30 to 50c.

BIDS: Ten bids were received April 30, 1941, ranging from the contract low of $1,111,879 to $2,057,283. Engineer's estimate, $1,243,172.

LIST OF BIDDERS:

1. Myers, Myers & Goen, Salem, Ind. (contract) $1,111,879
2. Southern Contracting & Engineering Co., Memphis, Tenn. 1,221,558
3. S. J. Groves & Sons Co., and Lundin Bros., Minnapolis and Mankato, Minn. 1,228,899
4. Atlas Constr. Co., and Oran Speer, Waxahachie, Tex. 1,248,718
5. S. E. Evans, Fort Smith, Ark. 1,287,846
6. Mittry Bros. Constr. Co., Los Angeles, Calif. 1,337,746
7. United Constr. Co., and Porter-DeWitt Constr. Co., Winona, Minn. 1,421,159
8. John Kerns Constr. Co., Omaha, Nebr. 1,458,345
9. Morrison-Knudsen Co., Inc., Boise, Idaho 1,513,527
10. Michael Pontarelli & Sons, Chicago, Ill. 2,057,283

		Unit Prices		
Item	Quan.	(1)	(2)	(3)
1. Care and diversion of river	L.S.	$40,000.00	$60,000.00	$25,000.00
2. Stripping, embankment and dikes	75,000 c.y.	.28	.20	.30
3. Common excavation, general	243,000 c.y.	.28	.29	.30
4. Common excav., borrow areas	1,528,000 c.y.	.28	.28	.25
5. Rock excavation, general	27,000 c.y.	.80	.80	1.00
6. Rock excavation, trenches	650 c.y.	5.00	10.00	10.00
7. Drill and blast, Area A	L.S.	7,200.00	9,000.00	10,000.00
8. Close line drilling	12,500 s.f.	.50	.75	.80
9. Drilling 3-in. holes	3,000 l.f.	.50	1.00	.50
10. Core drilling 3-in. holes	2,500 l.f.	1.50	3.00	3.00
11. Pressure grouting	4,000 c.f.	1.00	1.50	2.00
12. Foundation preparation	700 sq.	7.50	10.00	1.00
13. Protect. treatment for shale	700 sq.	5.00	4.50	5.00
14. Bituminous cover for shale	150 sq.	4.00	2.00	5.00
15. Settlement gages and seepage walls	L.S.	580.00	1,800.00	6,000.00
16. Backfill	9,500 c.y.	.40	1.00	.80
17. Selected and random imperv. fill	1,290,000 c.y.	.04	.05	.06
18. Random pervious fill	208,000 c.y.	.04	.04	.06
19. Rolling, each add'l. pass; sheep's-foot roller	150,000 sq.	.005	.01	.02
20. Rolling, each add'l. pass; tractor	14,000 sq.	.005	.01	.03
21. Sand—drain and backing	37,000 c.y.	2.50	2.85	3.00
22. Rock gutters	500 c.y.	4.75	10.00	18.00
23. Crushed rock or gravel	9,900 c.y.	1.50	3.00	2.50
24. Gravel surfacing, roadways	2,500 c.y.	1.90	2.50	2.50
25. Dumped riprap	66,000 c.y.	2.00	2.00	1.85
26. Furnishing cement	13,500 bbl.	2.60	2.75	2.75
27. Concrete, spillway walls	4,200 c.y.	10.65	13.00	18.00
28. Concrete, bridge (above El. 415.0)	550 c.y.	14.00	19.00	30.00
29. Conc.—weir, bridge, footings, floor and cut-off wall	5,400 c.y.	8.35	10.50	12.00
30. 6-in. perforated conc. pipe	660 l.f.	.90	.90	1.00
31. 8-in. perforated conc. pipe	900 l.f.	1.00	1.25	1.50
32. 18-in. perforated conc. pipe	1,700 l.f.	2.00	2.25	2.50
33. Manholes	3 ea.	300.00	200.00	100.00
34. Copper water stops	5,600 lb.	.55	.50	.60
35. Setting anchors	290 ea.	2.50	1.50	2.00
36. Reinforcing steel	710,000 lb.	.05	.046	.06
37. Black steel pipe	980 lb.	.15	.30	.20
38. Highway posts	520 ea.	1.75	2.00	2.00
39. Highway guardrail	1,520 l.f.	.90	.75	1.15
40. Topsoil	9,800 c.y.	.30	.40	1.50
41. Spot sodding	5,300 sq.	.40	.35	.80
42. Water supply system for Gov't. field office	L.S.	1,000.00	1,500.00	2,000.00

EMBANKMENT AND SPILLWAY YOUGHIOGHENY DAM, PA.

OWNER: U. S. Engineer Office, Pittsburgh, Pa.

PROJECT: Construction of embankment and spillway for Youghiogheny Dam on the Youghiogheny River, approximately one mile south of Confluence, in Somerset County, Pa. Work involves the following major features: clearing, grubbing and stripping; cofferdams; spillway excavation; construction of embankment; concrete lining for spillway; and roadway and guard fences.

CONDITIONS: Contractor to furnish all materials and complete work in 1,350 calendar days, without interference to others employed on construction of outlet works. Railroad and highway transportation facilities available. Wage rates specified as minimum are: skilled labor, 90c. to $1.40 per hr.; semi-skilled, 65 to 90c.; and common, 55c.

BIDS: Three bids were opened May 2, 1941 ranging from the contract low of $3,675,265 to $4,461,775. Engineers estimate, $3,656,189.

LIST OF BIDDERS:

1. Hunkin-Conkey Constr. Co., Cleveland, Ohio, and Shofner, Gordon & Hinman, Los Angeles, Calif. (contract) $3,675,265
2. George M. Brewster & Son, Inc., Bogota, N. J. 3,988,542
3. Frank Mashuda Co., Milwaukee, Wis.; John F. Bloomer, Appleton, Wis.; Joseph D. Bonness, Inc., Milwaukee, Wis.; Herman Holmes, Crystal Falls, Mich. 4,461,775

		Unit Prices		
Item	Quan.	(1)	(2)	(3)
1. Clear, grub, remove exist. struct.	27 ac.	$2,200.00	$1,250.00	$1,500.00
2. Cofferdam	L.S.	175,000.00	32,000.00	299,000.00
3. Common excavation	680,000 c.y.	.66	.65	.57
4. Rock excavation	1,894,000 c.y.	.66	.90	.72
5. Special rock excavation	7,000 c.y.	13.00	8.50	10.00
6. Crushing rock	963,500 c.y.	.21	.50	.46
7. Load and haul from stockpile	100,000 c.y.	.24	.35	.30
8. Excavation in borrow area	770,000 c.y.	.26	.25	.45
9. Selected impervious fill	430,000 c.y.	.09	.10	.09
10. Random fill	1,793,000 c.y.	.08	.10	.12
11. Filter fill	79,000 c.y.	.15	.05	.70
12. Rock fill	791,000 c.y.	.15	.10	.20
13. Rolling fill for each add'l 3 trips	440,000 sq. (100 s.f.)	.01	.005	.03
14. Rock gutters	550 c.y.	14.00	7.00	16.00
15. Settlement gages	L.S.	1,000.00	500.00	750.00
16. Core drilling, 2-in.	3,000 l.f.	2.00	1.50	2.16
17. Percussion drilling	42,000 l.f.	.90	.50	1.44
18. Furnishing cement	68,000 bbl.	2.15	2.40	2.68
19. Furn., install anchor bars	180,000 lb.	.09	.05	.09
20. Furn., install misc. metal	15,000 lb.	.20	.10	.065
21. Pressure grouting	20,000 bag cem.	1.00	.50	1.00
22. Gunite	2,000 c.f. sand	1.00	1.00	1.60
23. Concrete in grout cap	850 c.y.	20.00	9.00	14.00
24. Concrete in spillway	43,000 c.y.	10.50	7.75	12.70
25. Porous concrete	7,600 c.y.	13.00	8.15	14.50
26. Conc., gutters and headwalls	310 c.y.	22.00	15.15	26.00
27. Furn., install corr. metal pipe	230,000 lb.	.12	.08	.12
28. Porous drain tile	9,300 l.f.	1.30	.55	1.20
29. Road surfacing	9,600 s.y.	.90	1.20	1.60
30. Highway guard fence	4,600 l.f.	1.00	.95	1.00
31. Landscaping and planting	8,000 s.y.	.25	.30	.20
32. Reinforcing steel	700,000 lb.	.055	.05	.05

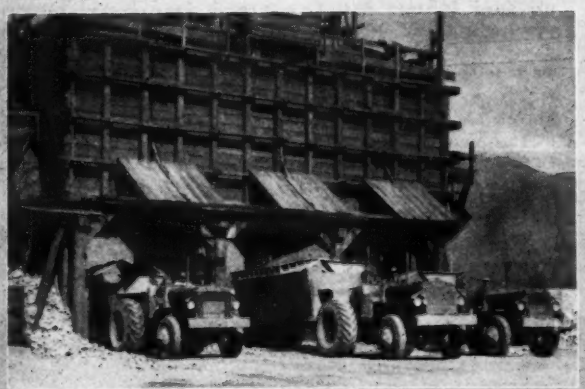
WHEN TIME IS SHORT

Performance is doubly important!

● Contractors and engineers always have to "work against time", but today's problems call for even greater speed and performance. We've simply got to get huge jobs done faster than ever so that it will not be too late—not only for our immediate needs, but for the America of tomorrow.

Euclid Self-Powered Hauling equipment is today helping to set new records in the construction of essential installations for our own government and industries as well as for those nations who are joined with us in the biggest job we've ever had. Day after day Euclids are hauling bigger loads faster on all kinds of jobs —and they're doing it with less time out for servicing and repairs. That's the kind of performance that's built into every Euclid, and it's one of the reasons why contractors depend on Euclids for the big rush jobs.

When repair parts are needed to keep Euclids rolling at peak performance, there are factory parts depots in Cleveland, Memphis, Hibbing and San Francisco, and Euclid distributors in every section of the country are ready and able to serve you efficiently.



The EUCLID ROAD MACHINERY Co. • Cleveland, Ohio

EUCLID

SELF-POWERED HAULING EQUIPMENT

For EARTH . . ROCK . . COAL . . ORE

CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS

How You Can Move Earth Faster, Same Time Conserve Critical Materials and Manpower

use TOURNAPULLS

To get top loading efficiency from high speed scraper units use a pusher. On jobs like this defense airport, Tournapulls pusher loaded by a "Caterpillar" D8 tractor get heaping loads in 30 to 60 seconds.

Now more than ever America needs manpower . . . needs speed on the construction of war bases . . . needs critical materials—steel and more steel —for greater striking power. With Tournapulls, you can help supply all 3 needs, effectively and profitably.

More Speed, More Yardage

Because Tournapulls are quickly pusher loaded, haul at fast construction speeds (up to 14.3 m.p.h.), and spread their own loads, they move more yardage faster. Take a look at this Tournapull chart. Compare the yardages with what you get from older, conventional methods and equipment.

Haul One Way	98 H.P. Model C (11 yards heaped)		150 H.P. Super C (15 yards heaped)	
	Trips	Pay Yards	Trips	Pay Yards
600	17.1	150	15.0	180
1200	14.0	119	12.0	144
1600	12.3	104	10.7	129
2000	10.9	93	9.7	116
3000	8.4	71	7.6	91
5000	5.8	50	5.4	65

These figures are based on a 60-minute hour, loading common earth on the level with a "Caterpillar" D8 pusher and hauling over good roads.

147,000 Lbs. More Steel for Victory

As an example, take a 2000-foot haul over good construction roads. Here, because of their high average speeds, 2 Super C Tournapulls plus a "Caterpillar" D8 pusher (total weight 98,000 lbs.) will dig, haul and spread as much earth as a 2½-yd. shovel plus six 5-yd. trucks and a spreading dozer (totaling approximately 245,000 lbs.) That's a saving of 147,000 pounds of steel, vitally needed for victory. What's more, the Tournapull fleet requires 7 less men, cuts your equipment investment almost in half and reduces cost per yard approximately 54%!

Already more than 550 Model C and Super C Tournapulls are hurrying earthmoving projects here and abroad, mostly on defense. Use job-proved Tournapulls on your project to: (1) conserve manpower, (2) save steel, (3) speed defense, (4) lower costs. See your LeTourneau-"Caterpillar" distributor NOW for prices and delivery dates.

Quick loading, fast acceleration, spreading on the fly, enable you to get high average speeds over construction roads. This Tournapull working on a government arsenal travels at 14.3 m.p.h.

R. G. LeTOURNEAU INC

Peoria, Ill., U.S.A. Cable Address "BOBLETORNO"

BLUESTONE DAM
WEST VIRGINIA

OWNER: War Department, U. S. Engineer Office, Huntington, W. Va. Major F. H. Falkner, District Engineer.

PROJECT: Construction of Bluestone Dam, a concrete gravity type structure, in the New River, about 0.6 mile above the junction of New and Greenbrier Rivers, near Hinton, W. Va. Dam to contain overflow section, outlet works, and power house intake section. Crest length about 2,060 ft., maximum height 180 ft. above foundation rock. Spillway to have crest length of 790 ft. Outlet works to be in spillway and consist of eight sluices, each with cast iron sluice gates; and two sluices each with a cast iron sluice gate and 48-in. needle valve. Intake section to have six steel penstocks for connection with power house.

CONDITIONS: Project has been assigned priority rating of A-2. Government to furnish emergency bulkhead for sluices, sluice gates, conduit linings and deflector plates, needle valves, crest gates, skim gate and trash chute emergency gate, oil pressure pumps, and drainage sump pumps. Contractor to furnish balance of material and complete work in 900 calendar days. Power house is to be constructed under another contract while work under this contract is being prosecuted. Bid price subject to adjustment for increases or decreases in direct labor and material costs, based on Bureau of Labor Statistics indexes of material prices and building labor rates. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 40 to 80c.; and common labor, 55c.

BIDS: Three bids were opened December 23, 1941, ranging from the low of $10,195,575 to $11,722,750. Engineer's estimate, $9,749,826.

LIST OF BIDDERS:

1. Seaboard Constr. Corp., Mt. Kisco, N. Y. $10,195,575
2. Dravo Corp., Pittsburgh, Pa. (contract) 11,376,080
3. B. Perini & Sons, Inc., and Rugo Constr. Co., Inc., Framingham, Mass. 11,722,750

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Cofferdams	L. S.	$494,200.00	$656,000.00	$700,000.00
2. Excavation, common	66,000 c. y.	.60	1.50	6.00
3. Excav., rock; above El. 1380	54,000 c. y.	3.50	2.50	6.00
4. Excav., rock, below El. 1380	203,000 c. y.	2.50	2.00	6.00
5. Excavation, foundation preparation	5,000 c. y.	15.00	5.00	7.00
6. Line drilling, rock	54,000 s. f.	1.00	.60	.75
7. Random fill	46,000 c. y.	.60	1.00	.15
8. Compacted fill	18,000 c. y.	1.00	1.60	.25
9. Rock paved gutters	220 c. y.	12.00	12.00	8.00
10. Rock surface treatment, per coat	1,000 sq.	10.00	7.00	25.00
11. Drilling 3-in. holes	13,000 l. f.	1.00	2.00	1.95
12. Drill 2½-in. holes	16,000 l. f.	.80	1.00	1.95
13. Drill 30-in. inspection wells	280 l. f.	50.00	30.00	40.00
14. 6-in. cores in concrete	1,000 l. f.	10.00	10.00	6.00
15. 12-in. cores in concrete	200 l. f.	20.00	15.00	12.00
16. Class A concrete	10,000 c. y.	20.00	20.00	17.35
17. Class B concrete	110,000 c. y.	10.00	13.00	12.40
18. Class C concrete	821,000 c. y.	7.30	8.00	7.50
19. Unload, haul and store cement	1,000,000 bbl.	.15	.15	.10
20. Furn. and install rein. steel	6,160,000 lb.	.05	.06	.05
21. Misc. steel, furnish and install	385,000 lb.	.25	.30	.15
22. Struct. steel, furn. and install	1,520,000 lb.	.12	.17	.15
23. Bronze, furn. and install	16,500 lb.	1.25	1.00	.40
24. Corrosion resisting bolts	1,300 lb.	.50	1.50	1.00
25. Rails for gantry and push car	196,000 lb.	.04	.10	.05
26. Timber work	1 M bm.	150.00	300.00	200.00
27. Copper water stops	50,000 lb.	.70	1.00	.40
28. Electrical system	L. S.	90,000.00	84,000.00	38,000.00
29. Electrical conduit	200,000 lb.	.10	.30	.18
30. Ornamental metal work	L. S.	7,200.00	10,000.00	6,000.00
31. Roofing and waterproofing	L. S.	3,000.00	4,000.00	1,250.00
32. Needle valves and accessories installed	65,000 lb.	.06	.04	.02
33. Tile gage, furn. and install	L. S.	1,200.00	1,600.00	1,000.00
34. Install sluice gates and all conduit linings	2,200,000 lb.	.03	.03	.025
35. Install crest gates and accessories	4,250,000 lb.	.03	.03	.02
36. Install oil pressure and sump pumps	25,000 lb.	.08	.04	.05
37. Inst. emergency bulkhead for sluices	84,000 lb.	.03	.04	.03
38. Plumbing system fixtures	L. S.	1,000.00	1,000.00	4,000.00
39. Oil, furnished and system filled	8,200 gal.	1.25	.60	.40
40. Black steel pipe	303,000 lb.	.10	.14	.06
41. Wrought iron pipe	158,000 lb.	.15	.24	.13
42. Cast iron pipe	12,500 lb.	.20	.12	.10
43. Brass pipe	200 lb.	2.00	1.50	.35
44. Malleable iron pipe fittings	7,400 lb.	.40	1.00	.50
45. Cast iron pipe fittings	54,500 lb.	.30	.24	.12
46. Steel pipe fittings, incl. companion flanges	37,000 lb.	.25	.60	.25
47. Brass pipe fittings	900 lb.	2.00	1.50	.75
48. Piping accessories	16,000 lb.	.30	.60	.25
49. Valves, straightway, 1500-lb. pressure, semi-steel, 2½-in.	2 ea.	160.00	150.00	200.00
50. As above, 1½-in.	56 ea.	60.00	80.00	75.00
51. As above, four-way, 1½-in.	10 ea.	110.00	120.00	150.00
52. 18-in. automatic drainage gate	1 ea.	100.00	100.00	100.00
53. Valves, swing check, high pressure, 2½-in.	2 ea.	60.00	80.00	100.00
54. Hydraulic gage, 1600-lb., 6-in. dial with gage cock	12 ea.	25.00	40.00	30.00
55. Floor stand, painted column, japanned wheel, no indicator, 32-in., with ex. stem	1 ea.	40.00	60.00	250.00
56. Gate and swing check valves, 3½-in. and larger	7,200 lb.	.50	.50	.45
57. Valves, cocks and faucets, brass and bronze	100 lb.	2.00	3.00	1.25
58. Valves, angle and globe	4,900 lb.	2.50	.60	.40
59. Iron cocks	200 lb.	2.00	.50	1.00
60. Highway guard rail	400 l. f.	4.00	3.00	2.00

WALLACE LAKE DAM
LOUISIANA

OWNER: U. S. Engineer Office, Vicksburg, Miss.

PROJECT: Construction of rolled fill earth dam and concrete spillway 4,940 ft. long, on Cypress Bayou, in Caddo and DeSoto Parishes, about 14 miles southeast of Shreveport, La. Involves preparation of site; rolled fill embankment of dam, the major part of which is to be composed of impervious material from borrow pits and spillway excavation; spillway and channel excavation; concrete spillway of ogee gravity type, 644 ft. wide, incorporating battery of four outlet conduits designed to discharge a combined maximum of 2,600 c.f.s. Trash racks to be provided. Spillway and outlet discharge into concrete lined stilling basins. Abutment walls to be concrete, of the counterfort and cantilever types.

CONDITIONS: Contractor to furnish all materials and complete work in 365 calendar days. Railway and highway transportation facilities available. Wage rates specified are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled 35 to 75c; and common labor 35c.

BIDS: Two bids were opened June 25, 1941, the contract low of $786,369 and $1,006,395. Estimated cost, $642,330.

LIST OF BIDDERS:

1. Newson Bros. & J. W. Snowden, Columbia, Miss. $786,369
2. Forcum-James Co., Dyersburg, Tenn. 1,006,395

Item	Quan.	Unit Prices (1)	(2)
1. Preparation of site	L. S.	$6,500.00	$6,000.00
2. Stripping	6,800 c. y.	.30	.50
3. Excavation, spillway	120,600 c. y.	.27	.55
4. Excavation, channel	47,400 c. y.	.25	.30
5. Excav.; borrow area "A"	105,400 c. y.	.25	.30
6. Excav.; borrow area "B"	314,900 c. y.	.22	.30
7. Excav.; borrow area "C"	29,100 c. y.	.24	.30
8. Rolled fill, impervious	541,000 c. y.	.13	.06
9. Rolled fill, relatively pervious	21,500 c. y.	.13	.06
10. Rolling for add'l. 2 passes	500,000 sq.	.02	.03
11. Sand fill	2,340 c. y.	4.60	3.50
12. Topsoil	2,800 c. y.	.55	.75
13. 6-in. perf. corr. pipe drains	1,800 l. f.	1.00	2.00
14. Gravel for drains and filter beds	2,450 c. y.	5.50	3.00
15. Spot sodding	111,700 s. y.	.03	.15
16. Hand placed riprap	3,140 c. y.	9.00	12.00
17. Derrick stone	3,770 c. y.	9.00	12.00
18. Steel sheet piling	15,520 s. f.	1.17	2.00
19. Timber bearing piles, battered	9,230 l. f.	.70	1.35
20. Timber bearing piles, vertical	92,070 l. f.	.65	1.15
21. Pile loading test, vertical, single	6 ea.	200.00	300.00
22. Pile loading test, vertical, group	1 ea.	600.00	1,500.00
23. Pile loading test, horizontal, single	4 ea.	100.00	250.00
24. Class B concrete in walls	2,475 c. y.	18.00	23.00
25. Class B concrete in spillway weir	12,340 c. y.	16.00	19.00
26. Class B concrete in stilling basins, pavements and conserv. weir	4,800 c. y.	16.00	20.00
27. Class A concrete in trash rack	50 c. y.	55.00	50.00
28. Steel reinforcement	604,100 lb.	.055	.06
29. Copper water stops	4,270 lb.	.75	.75
30. Wire fence	165 l. f.	3.50	5.00
31. Pipe guard rail	154 l. f.	5.00	5.00
32. 3-in. galv. wr. iron pipe	1,780 l. f.	1.00	2.50
33. Gaging stations	L. S.	3,000.00	10,000.00
34. Water level recorders	2 ea.	400.00	450.00
35. Engineering field office	L. S.	3,000.00	12,000.00

BERLIN DAM, OHIO

OWNER: U. S. Engineer Office, Pittsburgh, Pa. Lt. Col. D. Lee Hooper, District Engineer.

PROJECT: Construction of Berlin Dam, a concrete and earth structure, and appurtenant work in Mahoning and Portage Counties, Ohio, on the Mahoning River. Site of work is approximately 1½ miles below bridge on U. S. Route 224, between Berlin Center and Deerfield, Ohio. Involves the following major features: clearing, grubbing and stripping; cofferdams; excavation; concrete; construction of embankments; and installation of equipment.

CONDITIONS: Government to furnish embedded metal for crest gates, stop log recess rails, supporting beams for hoisting machines, service water supply pump and tank, sump pumps, and fuel tanks for diesel-electric stand-by unit. Contractor to install this material. The contractor is responsible for transporting and storing diesel-electric stand-by unit, air compressor unit, and heater elements for seal channels, but not for the installation of these items. Rail and highway transportation facilities available. Project to be completed in 360 calendar days. Wage rates are: skilled labor, $1.25 to $1.75 per hr.; semi-skilled, 55c. to $1.45; and common labor, 75c.

BIDS: Eleven bids were opened December 22, 1941, ranging from the contract low of $1,077,112 to $2,175,880. Engineer's estimate, $1,121,151.

LIST OF BIDDERS:

1. E. J. Albrecht Co., Chicago, Ill. (contract) $1,077,112
2. Hunkin-Conkey Constr. Co., Cleveland, Ohio 1,249,923
3. The Hinman Bros. Constr. Co., Pittsburgh, Pa., and Denver, Colo. 1,451,201
4. George M. Brewster & Son, Inc., Bogota, N. J. 1,451,654
5. C. E. Knowles Co., Inc., Gowanda, N. Y. 1,494,914
6. Clevorock, Inc., New York, N. Y. 1,553,668
7. John F. Casey Co., Pittsburgh, Pa. 1,577,118
8. Badgett Constr. Co., Memphis, Tenn. 1,775,116
9. H. F. McLean, Inc., White Plains, N. Y. 1,807,898
10. Horvitz Co., Cleveland, Ohio 1,818,091
11. Great Lakes Dredge and Dock Co., Chicago, Ill. 2,175,880

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Cofferdams	L. S.	$25,000.00	$50,220.00	$106,400.00
2. Clearing and grubbing	L. S.	21,000.00	9,654.00	40,000.00
3. Common excavation	51,000 c. y.	1.00	.49	1.10
4. Common excav., borrow area	222,000 c. y.	.50	.20	.55
5. Rock excavation	41,000 c. y.	2.00	1.64	2.50
6. Rock excav., borrow area	3,000 c. y.	2.00	1.08	1.00
7. Special rock excavation	6,000 c. y.	7.00	7.63	9.00
8. Line drilling	9,000 s. f.	1.00	.80	1.00
9. Rock treatment (one coat)	100 sq.	5.00	.98	10.00
10. Random fill	219,000 c. y.	.10	.06	.15
11. Uncompacted fill	4,000 c. y.	.08	.25	.50
12. Selected pervious fill	75,000 c. y.	.10	.19	.15
13. Dumped rock	15,000 c. y.	1.35	.60	.30
14. Rock fill (hand placed)	300 c. y.	5.00	8.40	2.00
15. Percussion drill 3-in. holes (rock)	7,500 l. f.	1.00	.60	1.40
16. Drill 6-in. core holes	60 l. f.	10.00	140.00	10.00
17. Furnishing cement	60,000 bbl.	2.00	2.80	2.30
18. Reinforcing steel	250,000 lb.	.045	.08	.06
19. Class A concrete	1,000 c. y.	26.00	52.20	50.00
20. Class B concrete	28,000 c. y.	8.20	10.96	11.00
21. Class C concrete	29,000 c. y.	8.20	10.96	11.00
22. Haul, store and install equipt. furnished by government	2,500 lb.	.08	.07	.20
23. Haul and store equipt. furnished by by government	12,000 lb.	.02	.02	.10
24. Inst. struct. steel furnished by govt.	55,600 lb.	.01	.02	.06
25. Furn. and inst. structural steel	9,400 lb.	.10	.16	.20
26. Furn. and inst. misc. metal work	24,000 lb.	.15	.28	.20
27. Furn. and inst. ornament. metal work	L. S.	2,000.00	2,079.00	3,000.00
28. Plumbing system	L. S.	1,400.00	766.00	1,500.00
29. Air bubbler, fuel oil and grease piping	L. S.	1,100.00	1,183.00	1,000.00
30. Black steel pipe	15,000 lb.	.15	.27	.20
31. 36-in. sluice gates	3 ea.	1,800.00	2,710.00	2,000.00
32. Cast iron pipe	29,000 lb.	.06	.12	.20
33. Iron castings	9,600 lb.	.20	.32	.20
34. Misc. brass and bronze fittings	150 lb.	1.00	2.73	1.50
35. Rail and accessories	42,000 lb.	.05	.16	.08
36. Timber water stops	1,100 l. f.	.36	.45	.30
37. Conduits for electric wiring	L. S.	2,000.00	3,013.00	3,000.00
38. Power and lighting system	L. S.	7,000.00	10,430.00	10,000.00
39. Welding (struct. steel rod)	100 c. in.	1.00	9.80	1.00
40. Road surfacing	6,000 s. y.	1.20	2.18	1.60
41. Highway guard fence	4,300 l. f.	1.00	1.54	.80
42. Timber	1,400 bd. ft.	.10	.17	.15
43. Additional tractor compaction	100 hr.	6.00	9.80	6.00

KESWICK DAM CALIFORNIA

OWNER: Bureau of Reclamation, Sacramento, Calif.

PROJECT: Construction of first stage of Keswick Dam (Spec. 960.) including foundation and base of abutments, spillway, and powerhouse, and nearly complete construction of fish trap in center of dam. Dam is on Sacramento River about 4 miles northwest of Redding, Calif., a portion of the Central Valley Project, California. Involves construction of 1⅓ miles of operating road between Quartz Hill Road and left abutment of dam, and excavation required for relocation of railroad at right end of dam. Relocation of railroad to permit construction of right abutment and powerhouse substructure. Foundation prepared by excavation to solid rock, faults and seams to be filled with concrete; and consolidating rock through low pressure shallow grouting. Concrete to be cooled by pumping river water through pipes embedded in concrete.

CONDITIONS: Contractor to furnish all form materials, wire, wire ties; temporary supports; welding or brazing rods; backfill materials; mineral aggregates for road surfacing; temporary shaft and cut-off-trench timbering; all water; rock and rock spalls; curing compounds; road surfacing materials; calking material; and all other materials not part of completed structure. Work to be completed in 500 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 1.18¾ to $1.75 per hr.; semi-skilled, 75c. to $1.25; and common labor, 75 to 80c.

BIDS: Three bids were opened August 1, 1941, ranging from the contract low of $2,736,629 to $3,149,170.

LIST OF BIDDERS:

1. Guy F. Atkinson Co., and W. E. Kier Constr. Co., San Francisco, Calif. (contract) $2,736,629
2. Pacific Constructors, Inc., Los Angeles, Calif. 2,956,000
3. Macco Constr. Co., Heafey-Moore Co., Fredrickson & Watson Constr. Co., Oakland, Calif. 3,149,170

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Diversion, care of river, unwater found	L. S.	$50,000.00	$50,000.00	$200,000.00
2. Common excav. for dam, except rt. abut. above subgrade of relocated R. R., and in shafts for fault and seam cutoffs	110,000 c. y.	2.10	3.50	4.15
3. Rock excavation, as above	286,000 c. y.	2.10	3.50	4.15
4. Drill line holes for trench excav.	23,000 l. f.	.50	1.00	.50
5. Excav., all classes in shafts for fault and seam cutoffs	260 c. y.	40.00	25.00	25.00
6. Common excav. for R. R. relocation and rt. abut. above reloc. R. R. subgrade	286,000 c. y.	1.65	.90	.75
7. Rock excavation, as above	165,000 c. y.	1.65	.90	.75
8. Excavation, common, for road	32,000 c. y.	.50	1.50	.30
9. Excavation, rock, for road	8,000 c. y.	1.25	1.50	.30
10. Excav., common; road structures	200 c. y.	3.00	3.00	2.00
11. Excav., rock; road structures	50 c. y.	5.00	3.00	4.00
12. Backfill	5,700 c. y.	1.00	2.00	.75
13. Riprap	2,500 c. y.	1.50	1.00	1.50
14. Rubble-masonry walls	100 c. y.	25.00	30.00	14.00
15. Crusher-run base for rd. surf	3,900 c. y.	2.50	3.00	2.15
16. Watering road surfacing	126 M gal.	3.00	2.50	2.00
17. Apply liquid asph. prime coat	3,800 gal.	.03	.05	.10
18. Mineral aggregate for road-mix oil surf	1,300 c. y.	3.50	3.00	2.50
19. Apply liq. asphalt for road-mix oil surf	31,000 gal.	.03	.04	.02
20. Screenings for seal coat	110 c. y.	4.00	3.00	5.00
21. Apply liq. asph. emul. for seal coat	3,100 gal.	.03	.05	.10
22. Lay 24-in. corr. metal pipe	200 l. f.	1.00	1.15	.60
23. Lay 36-in. corr. metal pipe	50 l. f.	2.00	1.40	.90
24. Lay 48-in. corr. metal pipe	50 l. f.	3.00	2.00	1.20
25. Core drill 5½-in. holes to 30-ft.	240 l. f.	12.00	7.00	9.25
26. Drill 1¾-in. grout holes to 30-ft.	3,300 l. f.	3.00	1.50	1.55
27. As above, 30 to 50-ft. deep	500 l. f.	4.00	1.50	1.75
28. As above, 50 to 75-ft. deep	500 l. f.	5.00	1.50	2.00
29. Drill holes for setting foundations, drainage, and future grout. pipes	240 ea.	5.00	3.50	10.00
30. Place std. pipe and fittings for fndn. grouting and drainage	37,000 lb.	.12	.08	.15
31. Place metal tubing and fittings, for grouting contraction joints and fault and seam cutoffs	8,000 lb.	.15	.18	.20
32. Constr. anchorages for grout outlets in rock	50 ea.	5.00	6.00	5.00

33. Pressure grouting	5,000 c. f.	1.50	4.00	1.75
34. Pressure grouting with peckers	4,000 c. f.	2.25	4.50	2.25
35. Constr. 6-in. split sewer pipe drains covered with gravel	50 l. f.	2.00	1.10	1.00
36. As above, 12-in.	210 l. f.	2.25	1.50	1.50
37. As above, laying 12-in., no gravel covering	1,500 l. f.	1.00	1.15	.60
38. As above, laying 24-in., no gravel covering	300 l. f.	1.50	1.50	1.50
39. Lay 6-in. sew. pipe, no gravel covering	140 l. f.	.75	1.10	1.00
40. Constr. 8-in. sew. pipe drain, embedded in gravel	800 l. f.	1.00	1.25	1.00
41. Drill holes for anchor bars and grouting bars in place	3,100 l. f.	1.50	.65	1.50
42. Concrete in dam	38,700 c. y.	8.78	6.00	7.50
43. Concrete in piers	5,400 c. y.	8.50	9.00	8.20
44. Concrete in spillway apron	7,700 c. y.	8.50	6.00	6.00
45. Conc. in left training wall	3,500 c. y.	10.00	11.00	9.00
46. Conc. to 24-in. thick in fish-trap sect.	1,270 c. y.	36.00	38.00	23.00
47. As above, over 24-in. thick	18,500 c. y.	8.50	10.00	7.50
48. Conc. in powerhouse substruct.	18,000 c. y.	8.50	10.00	8.00
49. Lean conc. for reinf. bar protection	600 c. y.	11.00	12.00	14.00
50. Conc. in fault and seam cutoffs	260 c. y.	12.50	12.00	10.00
51. Concrete in road structures	25 c. y.	25.00	40.00	40.00
52. Place reinforcing bars	3,600,000 lb.	.018	.023	.02
53. Place metal tubing and fittings for conc. cooling systems	43,000 lb.	.20	.17	.10
54. Cooling concrete	45,000 c. y.	.30	.17	.40
55. Place metal seal. strips, without protect. strips	5,500 l. f.	.75	.92	.50
56. As above, with protect. strips	3,300 l. f.	1.00	1.15	.60
57. Construct asphalt seals	1,220 l. f.	3.00	2.00	1.00
58. Place tubular rubber seals	60 l. f.	1.00	2.75	1.00
59. Place elastic joint filler	3,700 s. f.	.20	.20	.50
60. Fabricate and install timber apurt	15 M bm.	150.00	100.00	100.00
61. Place stop-log and blkhd.-gate guides	79,000 lb.	.04	.10	.06
62. Inst. crane, hoists and fish sweep	40,000 lb.	.04	.10	.08
63. Lay track rails	1,600 lb.	.05	.05	.08
64. Inst. gates and gate hoists	61,000 lb.	.05	.05	.05
65. Inst. stairway, ladders, frames, guides	51,000 lb.	.25	.10	.10
66. Place metal floor plates, gratings, trashracks	4,000 lb.	.05	.06	.10
67. Inst. std. pipe, fittings, valves, to 6-in.	3,500 lb.	.20	.09	.12
68. As above, over 6-in.	60,000 lb.	.08	.07	.12
69. Construct pipe handrails	5,000 lb.	.30	.09	.20
70. Place 5-ft. steel pipe and 1,000-gal. fish tank	13,000 lb.	.04	.10	.05
71. Place anchor bolts for spillway gates	1,700 lb.	.25	.23	.10
72. Place electrical metal conduit	1,400 l. f.	.50	1.25	.50
73. Install electrical conductors	100 lb.	.50	.10	1.00
74. Inst. ground wires and ground rods	5,500 lb.	.25	.18	.50

ST. LUCIE DAM
FLORIDA

OWNER: U. S. Engineer Office, Jacksonville, Fla.

PROJECT: Construction of St. Lucie Dam at St. Lucie Lock on St. Lucie Canal, near Stuart, Fla. Involves construction of diversion channel, earth diversion dam, and concrete diversion spillway; cofferdams, including maintenance and removal; cleaning site and alteration of existing structures; structure excavation, fill, protective dikes and ditches; foundation piling and steel sheet piling walls; concrete masonry; stone protection work; auxiliary lock gate; seven taintor gates; taintor gate operating machinery; emergency bulkheads and hoist; hydroelectric power house; dam electrical system; hydroelectric generator unit; and other miscellaneous items.

CONDITIONS: Contractor to furnish all materials and complete work in 480 calendar days. Highway and water transportation facilities available at site of work, and railway facilities at Stuart, Port Mayaca, and Indian Town, Fla. Wage rates are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 60 to 82½c.; and common, 40c.

BIDS: Five bids were received August 19, 1941 ranging from the contract low of $571,134 to $956,838. Engineer's estimate, $562,245. Awarded September 9.

LIST OF BIDDERS:

1. V. P. Loftis Co., Charlotte, N. C. (contract) $571,134
2. Spadaro Contracting Co., Sarasota, Fla. 593,253
3. E. H. Latham Co., West Palm Beach, Fla. 728,565
4. Cleary Bros. Constr. Co., West Palm Beach, Fla. 772,197
5. Badgett Constr. Co., Memphis, Tenn. 956,838

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	L. S.	$9,000.00	$4,400.00	$8,747.26
2. Cofferdam; diversion spillway	143 l. f.	60.00	75.00	30.50
3. Cofferdam; dam	427.12 l. f.	125.00	150.00	333.20
4. Excavation; structure	19,000 c. y.	.50	1.25	.687
5. Excavation; diversion channel	60,700 c. y.	.20	.60	.29
6. Excavation; drainage ditch	3,200 c. y.	.20	.66	.29
7. Embankment; dike	68,200 c. y.	.20	.40	.218
8. Embankment; diversion dam	17,600 c. y.	.20	.40	.218
9. Fill	3,600 c. y.	.20	.40	.36
10. Remove existing concrete	505 c. y.	5.00	6.00	29.08
11. Piling; timber foundation	28,300 l. f.	.50	1.00	.605
12. Piling; steel sheet, cut-off walls	20,420 s. f.	1.30	1.50	1.50
13. Piling; steel sheet, extended Z type	1,103 s. f.	1.80	3.00	2.28
14. Piling; steel sheet, deep-arch	1,560 s. f.	1.60	3.00	2.21
15. Yellow pine timber; creosoted	1,275 f. bm.	.25	.20	.36
16. Stone riprap	5,300 c. y.	7.00	5.00	4.217
17. Crushed stone	1,300 c. y.	5.00	5.00	4.65
18. Class A concrete	810 c. y.	30.00	35.00	31.61
19. Class B concrete	6,550 c. y.	20.00	21.00	20.61
20. Concrete; slushing	400 c. y.	15.00	16.00	12.515
21. Steel; struct., phosphor. chromium, Taintor gates	100.25 lb.	.27	.10	.2311
22. Steel; struct., phosphor. chromium, auxiliary lock gate	28,850 lb.	.30	.10	.2544
23. Steel; as above, fixed members	108,080 lb.	.28	.10	.2544
24. Steel; as above, bulkheads	9,325 lb.	.28	.10	.2311
25. Structural steel	41,670 lb.	.17	.10	.2311
26. Rail; bulkhead hoist track	11,500 lb.	.15	.09	.1195
27. Steel; tie-rods, nuts, turnbuckles, pins	3,345 lb.	.33	.10	.26
28. Steel; corrosion-resisting	1,110 lb.	.54	.70	2.035
29. Concrete reinforcing steel	321,000 lb.	.09	.05	.069
30. Castings; steel	10,115 lb.	.25	.18	.288
31. Castings; iron	4,390 lb.	.22	.12	.2268
32. Bolts and nuts; steel	11,670 lb.	.34	.10	.2513
33. Forgings; nickle steel	7,425 lb.	.40	.28	.90
34. Bronze	2,090 lb.	.50	.74	1.27
35. Lead	3,955 lb.	.25	.18	.225
36. Copper-sealing strip	3,440 lb.	.35	1.00	1.236
37. Rubber seals; molded	1,415 lb.	.60	.60	1.716
38. Handrail; type A	122 l. f.	4.75	3.00	4.36
39. Handrail; type B	260 l. f.	3.50	2.75	2.18
40. Handrail; type C	980 l. f.	4.50	2.50	3.78
41. Indicator gages; taintor gate position	7 ea.	125.00	25.00	122.60
42. Lubrication systems; taintor and aux. lock gates	L. S.	500.00	200.00	980.80
43. Equalizing valves, 10x10-in.	2 ea.	200.00	90.00	436.20
44. Power house substr. drainage system	L. S.	800.00	3,000.00	722.64
45. Pressure relief drain (assembly)	L. S.	300.00	100.00	1.00
46. 10-in. corr. metal pipe	48 l. f.	3.00	5.00	2.91
47. Extend existing water systems	L. S.	800.00	1,640.00	436.20
48. Install 24-in. metal culvert pipe	L. S.	500.00	1,150.00	218.10
49. Drill 1¼-in. anchor holes	30 l. f.	1.00	4.00	2.18
50. Drill 6-in. pressure relief vents	45 l. f.	3.00	10.00	8.72
51. Hydroelectric power house	L. S.	8,000.00	8,000.00	4,545.85
52. Taintor gate operating mach'y., mechanical equipment	L. S.	10,000.00	28,000.00	44,871.60
53. As above: electrical equipment	L. S.	2,500.00	4,200.00	16,027.83
54. Bulkhead hoist car	1 ea.	5,000.00	1,800.00	5,884.80
55. Power house crane	1 ea.	1,500.00	1,500.00	2,181.00
56. Hydroelectric unit	L. S.	24,750.00	10,000.00	31,655.20
57. Conduit system	L. S.	3,000.00	3,500.00	3,799.06
58. Switchboard	L. S.	6,500.00	3,700.00	9,019.39
59. Dam power feeders and connections	L. S.	1,500.00	1,200.00	346.12
60. Lighting system	L. S.	6,000.00	3,800.00	3,752.31
61. Grounding system	L. S.	500.00	1,200.00	591.15
62. Hydroelectric power house; central control station interconnecting cables	L. S.	2,000.00	1,800.00	2,113.97
63. Remove existing riprap	2,000 c. y.	1.50	1.00	1.454

SANTA FE DAM
LOS ANGELES, CALIF.

OWNER: U. S. Engineer Office, Los Angeles, Calif.; Lt. Col. Edwin C. Kelton, district engineer.

PROJECT: Construction of Santa Fe Dam, an earth-fill type structure, on San Gabriel River, west of Irwindale Ave., between Arrow Highway and Foothill Blvd, southwest of Azusa, Los Angeles County, Calif. Consists of five zones, determined by size and quality of material and method of placing. Material for embankment secured from required excavations and borrow pits. Crest length of dam 24,000 ft. Water passed through dam by outlet works in main embankment and through spillway in right wing. Outlet works consist of 16 gate openings. Approach and discharge channels to be built. Service building to be constructed on downstream side of embankment. Levees, 5,000-ft. long and 12-ft. high to be built downstream from spillway.

CONDITIONS: Government to furnish cement, service gates, oil pumps, control valves, switchboard, gasoline-electric standby unit, service crane and trolley hoist. Contractor to furnish all other material and complete work by Dec. 1, 1942. Railway and highway transportation facilities available adjacent to site of work. Wage rates specified are: skilled labor, $1.00 to $1.75 per hr.; semi-skilled, 68¾c. to $1.25; and common, 75 to 87½c. Work in bed of intermittently flowing stream having considerable run-off in rainy season.

BIDS: Four bids were opened June 12, 1941, ranging from the contract low of $8,837,200 to $9,244,569. Engineer's estimate $7,483,310.

LIST OF BIDDERS:

1. Morrison-Knudsen Co., Inc., J. F. Shea Co., Inc., Ford J. Twaits, and Winston Bros. Co., Los Angeles, Calif (contract) $8,837,200
2. W. E. Callahan Constr. Co., George W. Condon Co., Peter Kiewit Sons' Co., Gunther & Shirley Co., Los Angeles, Calif. 8,986,060
3. Nicholas F. Jahn, Vincent Bressi, Matt J. Bevanda, John MacLeod, Adolph Tiechert, Jr., Chester M. Elliot, Lloyd S. Stroud, Reginald S. Seabrook, David G. Gordon, William S. Broderick, Los Angeles, Calif. 9,187,069
4. Guy F. Atkinson Co., San Francisco, Calif. 9,244,569

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Diversion and care of water	L.S.	$25,000.00	$300,000.00	$195,360.00
2. Remove exist. struct. and obstructions	L.S.	25,000.00	40,000.00	35,000.00
3. Clearing and grubbing	L.S.	25,000.00	25,000.00	45,000.00
4. Stripping	640,000 c.y.	.45	.35	.30
5. Common excavation	1,130,000 c.y.	.35	.35	.33
6. Structure excavation	31,000 c.y.	1.25	.75	1.00
7. Excav.; borrow pit A	1,400,000 c.y.	.45	.43	.50
8. Excav.; borrow pit B	11,000,000 c.y.	.32	.33	.31
9. Backfill	154,000 c.y.	.25	.25	.20
10. Fill in dam embank.; Zone 1	1,000,000 c.y.	.115	.10	.14
11. Fill in dam embank.; Zone 2	640,000 c.y.	.115	.10	.14
12. Fill in dam embank.; Zone 3	7,260,000 c.y.	.07	.07	.05
13. Fill in dam embank.; Zone 4	620,000 c.y.	.23	.07	.20
14. Fill in dam embank.; Zone 5	2,430,000 c.y.	.16	.07	.05
15. Rolling for two trips, Zones 1, 2 and 3	2,400,000 sq.	.01	.01	.005
16. Fill in levees and spillway channel	210,000 c.y.	.06	.07	.10
17. Quarry run rock; levee blanket, toes	92,000 c.y.	3.00	2.60	2.25
18. Derrick stone aprons	52,000 c.y.	3.70	3.00	3.00
19. Grouted rock paving	1,250 sq.	33.00	45.00	28.50
20. Grouted rock ramps, curbs, steps	1,100 c.y.	15.00	20.00	13.00
21. Service road material	50,000 c.y.	.90	.40	.55
22. Plant mixed surfacing	8,400 s.y.	.70	.60	.55
23. Concrete; slabs, footings, cut-offs	70,000 c.y.	4.00	6.00	10.00
24. Concrete; spillway ogee	42,000 c.y.	4.60	4.50	5.10
25. Conc.; intake, control wks., walls, misc. struct	50,000 c.y.	11.00	15.00	20.00
26. Concreting service gate recesses	1,700 c.y.	5.75	15.00	10.00
27. Pressure grouting service gate castings	L.S.	1,000.00	2,000.00	500.00
28. Concreting derrick stone	8,500 c.y.	5.30	5.00	3.50
29. Grouting; quarry run rock and Zone 4 mat'l	10,000 c.y.	6.20	5.00	3.50
30. Furn., bend, place reinforcing bars	11,500,000 lb.	.046	.045	.05
31. ½-in. fibre expan. joint filler	100,000 s.f.	.20	.20	.16
32. ¾-in. fibre expan. joint filler	3,200 s.f.	.25	.25	.22
33. Steel joint seals	7,000 l.f.	2.10	1.40	1.10
34. Copper water stops	3,200 lb.	.65	.60	.70
35. Rubber joint seal, standard	1,600 l.f.	4.85	5.00	4.40
36. Rubber jt. seal, spec. ring seal No. 1	2 ea.	40.00	45.00	50.00
37. Rubber jt. seal, spec. ring seal No. 2	176 ea.	50.00	50.00	50.00
38. Rubber jt. seal, spec. tee No. 3	2 ea.	15.00	20.00	15.00
39. Bituminastic enamel, ⅛-in. thick	80,000 s.f.	.15	.10	.13
40. 4-in. vitrified clay pipe	120 l.f.	.80	.60	.50
41. 4-in. tile drains	325 l.f.	.50	.40	.50
42. 4-in. cast iron soil pipe	325 l.f.	1.60	1.00	1.50
43. Misc. black steel pipe	9,000 lb.	.21	.20	.15
44. Misc. galv. steel pipe	27,300 lb.	.37	.30	.25
45. Water control valves and hose bibbs	50 lb.	2.50	2.00	5.00
46. Gate vent, drainage, float well piping	357,000 lb.	.19	.20	.13
47. Inst. service gates and accessories	1,920,000 lb.	.03	.015	.02
48. Inst. oil pumping units	L.S.	200.00	230.00	250.00
49. Inst. contr. valves for oil pump. units	L.S.	100.00	110.00	500.00
50. Install switchboard	L.S.	260.00	300.00	250.00
51. Install gasoline-electric generator set	L.S.	400.00	300.00	250.00
52. Install service crane	L.S.	700.00	350.00	250.00
53. Install trolley hoist	L.S.	300.00	125.00	100.00
54. Oil pressure system	6,000 lb.	1.25	1.00	1.00
55. Furn. oil and fill oil system	4,100 gal.	.50	.60	.70
56. Conduit for electr. and teleph. wiring	12,000 lb.	.45	1.00	.50
57. Lighting and power system	L.S.	15,000.00	8,500.00	6,500.00
58. Underground power service	L.S.	2,500.00	1,900.00	1,500.00
59. Intercommunication system	L.S.	300.00	300.00	250.00
60. Misc. struct. steel and rails	463,000 lb.	.12	.10	.13
61. Miscellaneous metalwork	17,000 lb.	.30	.35	.30
62. Ventilating fan and piping	L.S.	1,400.00	600.00	1,500.00
63. Misc. steel tubing railings	450 lb.	1.00	.80	1.00
64. Spillway and channel fencing	1,250 l.f.	.60	1.00	.50
65. Float recorder house superstructure	L.S.	2,500.00	2,500.00	3,300.00
66. Service building superstructure	L.S.	22,000.00	20,000.00	30,000.00
67. Glass brick	12 ea.	2.50	4.00	5.00
68. Automatic drainage gate, 60x60-in	2 ea.	800.00	800.00	700.00
69. Autom. drainage gate, 30-in	3 ea.	140.00	110.00	200.00
70. 30-in. corr. metal pipe	630 l.f.	8.00	6.00	11.00
71. Gate assembly, 60-in	3 ea.	900.00	800.00	900.00
72. Corrugated metal sheets	5,700 s.f.	.40	.40	.40
73. Gravel drains	120 c.y.	4.00	1.50	5.00

DIVERSION AND OUTLET TUNNEL FOR GRANBY DAM, COLORADO

OWNER: Bureau of Reclamation, Denver, Colo.; S. O. Harper, chief engineer.

PROJECT: Construction of diversion and outlet tunnel at Granby Dam, Colorado-Big Thompson project, Colorado, including open-cut excavation for approaches to inlet and outlet ends of tunnel, open-cut excavation above El. 5154 for trash-rack structure at top of inlet shaft to outlet tunnel, open cut excavation to solid rock at top of elevator shaft above gate chamber, and construction of diversion and outlet tunnel, the inlet shaft to El. 8154, and elevator shaft to rock line at El. 8240 for outlet works. Located on Colorado River about five miles northeast of Granby, Colo.

CONDITIONS: Government to furnish cement; admixtures; reinforcement bars; concrete or clay sewer pipe for drains; pipe and fittings for grout connections; metal sealing strips and welding rods; metal ladder rungs, metal inserts for guide rail brackets; anchor bolts; pipe for placing concrete in diversion bypass conduit; and various other materials that will become part of completed construction. Access from existing roads to be provided by contractor. Railroad transportation available to Granby. Time for completion 225 calendar days. Wage rates are: skilled labor, $1.10 to $1.50 per hr.; semi-skilled, 70c. to $1.10; and common, 62½ to 72½c.

BIDS: Four bids were opened October 20, 1941, ranging from the contract low of $283,180 to $373,575. Awarded November 1, 1941.

LIST OF BIDDERS:

1. Platt Rogers, Inc., Pueblo, Colo. (contract) $283,180
2. Ed. H. Honnen Constr. Co., Colorado Springs, Colo. 317,870
3. Pioneer Constr. & Engr. Corp., and Dale Hinman, Denver, Colo. 342,975
4. S. S. Magoffin Co., Inc., Englewood, Colo. 373,575

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excav., strip sand and gravel deposit	1,500 c. y.	$1.00	$0.30	$0.30
2. Excavation, common, in open cut	15,000 c. y.	1.00	1.55	2.35
3. Excavation, rock, in open cut	7,000 c. y.	2.00	1.55	2.35
4. Excav., all classes, tunnel and shafts	7,800 c. y.	15.00	18.00	19.00
5. Furn. and place perm. str. steel tunnel supports	20,000 lb.	.10	.12	.15
6. Furn. and place steel tunnel-liner plates and steel lagging	40,000 lb.	.12	.11	.15
7. Cobble-and-rock fill on downstream slope of dam embank.	22,000 c. y.	.50	.50	.30
8. 4-in. sewer pipe drain, uncem. jts., embedded in porous conc	200 l. f.	2.00	2.60	3.00
9. Porous conc. in horisontal bands around elevator shaft	17 c. y.	40.00	20.00	50.00
10. Drilling weep holes	600 l. f.	.75	1.50	1.00
11. Drill 1¾-in. grout holes, to 10-ft	1,000 l. f.	.75	1.50	3.00
12. Place grout pipe and fittings	1,500 lb.	.50	.10	.25
13. Pressure grouting	3,000 c. f.	1.00	1.50	1.25
14. Concrete in tunnel lining	2,400 c. y.	30.00	32.00	30.00
15. Conc. in shaft, gate-chamber and tunnel-plug lining	700 c. y.	35.00	35.00	45.00
16. Cone in tunnel inlet and outlet struct	300 c. y.	35.00	35.00	25.00
17. Placing reinforcement bars	200,000 lb.	.02	.025	.03
18. Place metal sealing strips	200 l. f.	.50	1.30	2.00
19. Install miscellaneous metal work	1,500 lb.	.50	.10	.30

HIGHWAY, MISSOURI

OWNER: State Highway Commission, Jefferson City, Mo.

PROJECT: Grading, constructing culverts, and producing crushed stone for coarse aggregate, together with incidental work, on State Route 66, Pulaski County, near Fort Leonard Wood from Big Piney River east through Hooker Hill Cut.

CONDITIONS: Contractor to furnish all materials and complete work in 180 working days. Rail and highway transportation facilities available. Minimum wages specified are: skilled labor, 80c. per hr.; semi-skilled, 50c.; and common, 40c.

BIDS: Four bids were opened September 5, 1941, ranging from the contract low of $244,889 to $343,325.

SAVE STEEL FOR SHIPS AND SHELLS
— The —
More Service You Can
Get Out of Your Wire Ropes,
the More Steel You Save for
Other Vital Uses

In the interest of our present National Emergency, we offer the following suggestions:

1. **Keep your wire rope using equipment in good condition. Sheaves should be of proper size, design, material—and free from corrugations. Keep all sheaves and idlers properly lubricated and in line. Avoid excessive fleet angles.**

2. **Keep your wire ropes thoroughly and correctly lubricated.**

3. **Avoid kinks and sudden jerks . . . also, avoid cross-winding on drums, and reverse bends if possible.**

4. **Make sure your wire ropes operate with an adequate factor of safety. If there is not a proper ratio between the strength of the rope and the maximum load to be handled, the rope may be overstressed—a condition no rope can long survive.**

5. **Use wire rope of the correct size, construction, type and grade for your particular conditions.**

The foregoing suggestions are necessarily brief. We shall be glad to give further particulars to any one interested.

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS — ESTABLISHED 1857

5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK . . . 90 West Street
CHICAGO . . 810 W. Washington Blvd.
DENVER . . . 1554 Wazee Street

HERCULES (RED STRAND) WIRE ROPE

SAN FRANCISCO . . 520 Fourth Street
PORTLAND . . 914 N. W. 14th Avenue
SEATTLE . . 3410 First Avenue South

LIST OF BIDDERS:

1. Fred Weber, Jr., St. Louis, Mo. (contract) $244,839
2. Gillioz Co., Inc., Monett, Mo. 314,293
3. Porter-DeWitt Constr. Co., Wappapello Dam, Mo. 317,351
4. O'Dell-Riney Constr. Co., Hannibal, Mo. 343,325

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	21.5 ac.	$75.00	$150.00	$100.00
2. Grubbing	21.5 ac.	75.00	50.00	50.00
3. Class A excavation	79,137 c. y.	.27	.60	.40
4. Class C excavation	198,622 c. y.	.77	.90	.94
5. Class 3 excavation, structures	985 c. y.	2.00	3.00	1.25
6. Compact embankments (roll)	86,610 c. y.	.01	.05	.05
7. Compacting in cuts (roll)	110 c. y.	1.00	.10	.30
8. Overhaul	21,800 ½-yd. mi.	.05	.08	.20
9. Broken stone	3,010 c. y.	2.00	1.50	1.40
10. Screenings	4,072 ton	2.00	2.50	1.00
11. Water (for compact. and roll)	15,610 hund. gal.	.01	.10	.10
12. Class B conc. (box culv.)	337.2 c. y.	25.00	30.00	30.00
13. Class B conc. (other than box culv.)	26.4 c. y.	50.00	35.00	35.00
14. 15-in. corr. met. culv. pipe	346 l. f.	1.75	2.00	1.70
15. 18-in. corr. met. culv. pipe (entrance and side road)	94 l. f.	2.50	2.25	2.00
16. 30-in., as above	112 l. f.	4.25	3.00	3.80
17. 15-in. rein. conc. pipe (cross road)	184 l. f.	2.00	2.50	2.20
18. Reinforcing steel	29,050 lb.	.06	.06	.06
19. Range rubble masonry	141.7 c. y.	15.00	12.00	20.00
20. Class A, type 1, underdrains	374 l. f.	1.00	1.75*	1.40*
21. Steel grates and bearing plates	350 lb.	.30	.25	.30
22. Coarse aggr. for Cl. B. conc. masonry	8,000 ton	.40	.50	.70
23. Coarse aggr. for pl. cem. conc. pavmt.	75,000 ton	.40	.50	.70

*Type 4 underdrain.

HIGHWAYS, WYOMING

OWNER: Wyoming State Highway Commission, Cheyenne.

PROJECT: Grading, drainage, base course surfacing, oil treatment by road-mix method, three timber trestle bridges, two reinforced concrete culverts, and miscellaneous work on 6.461 miles of the Cody-South Fork Road in Park County in northwestern Wyoming. Roadway to be 26-ft. wide. Top portion of subgrade to be constructed of pit run gravel, thickness to be 6 and 12-in. Base course 1½-in., oil treated gravel to be 1½-in.

CONDITIONS: Contractor to furnish all materials and complete work in 120 working days. One portion of road through solid rock, and sulphur deposits may be encountered in another section. Passes through an intensely irrigated section, and also a swampy area, necessitating many drainage and irrigation structures. Rail and highway transportation facilities available. Wage rates are: skilled labor, 80c. to $1.12½ per hr.; semi-skilled, 65c.; and common, 55c.

BIDS: Two bids were received September 16, 1941, the contract low of $157,703, and $160,335.

LIST OF BIDDERS:

1. Taggart Construction Co., Cody, Wyo. (contract) $157,703
2. Northwestern Engineering Co., Rapid City, S. D. 160,335

Item	Quan.	Unit Prices (1)	(2)
1. Excavation	239,500 c. y.	$0.24	$0.245
2. Watering (embankment)	3,000 M gal.	1.00	2.00
3. Sheep's foot roller operation	900 hr.	2.25	3.00
4. Pneumatic-tired roller operation	650 hr.	2.50	3.25
5. Overhaul	45,500 c. y. sta.	.015	.015
6. Haul	117,500 c. y. mi.	.17	.12
7. Excavation for pipe culverts	700 c. y.	1.00	1.00
8. Stone for drains	60 c. y.	1.00	5.00
9. Excavation for drains	60 c. y.	1.50	1.50
10. 6-in. perf. corr. metal pipe	300 l. f.	1.00	1.20
11. 18-in. corr. metal pipe	1,534 l. f.	1.95	2.00
12. 24-in. corr. metal pipe	568 l. f.	3.00	3.00
13. 30-in. corr. metal pipe	172 l. f.	3.70	3.65
14. 36-in. corr. metal pipe	300 l. f.	5.40	6.00
15. 42-in. corr. metal pipe	60 l. f.	6.90	7.00
16. 48-in. corr. metal pipe	194 l. f.	8.00	9.00
17. 60-in. corr. metal pipe	88 l. f.	13.00	11.00
18. 72-in. corr. metal pipe	100 l. f.	15.00	17.00
19. 18-in. vitrified clay pipe	303 l. f.	2.20	1.90
20. 24-in. vitrified clay pipe	39 l. f.	3.50	2.50
21. 22x13-in. corr. metal pipe arch culvert	98 l. f.	2.20	5.00
22. 30x17-in. corr. metal pipe arch culvert	54 l. f.	3.40	6.00
23. 44x25-in. corr. metal pipe arch culvert	64 l. f.	6.25	9.00
24. Mechanical tamping	570 hr.	2.00	2.50
25. Class I riprap	555 c. y.	5.00	3.50
26. Class A concrete	151.4 c. y.	23.00	24.00
27. Reinforcing steel	11,190 lb.	.10	.08
28. Trash racks	2 ea.	20.00	30.00
29. Right-of-way markers	27 ea.	5.00	5.00
30. Rein. concrete project markers	2 ea.	20.00	20.00
31. Structure excavation	580 c. y.	1.35	1.80
32. Grouted riprap	25 c. y.	7.00	16.00
33. Remove existing structures	L. S.	100.00	616.90
34. Guide posts	44 ea.	2.25	2.00
35. Cr. gravel surfacing (¾-in. max.)	6,750 ton	.85	.80
36. Cr. gravel base crse. (1-in. max.)	7,300 ton	.75	.80
37. M. C. liquid asph. dist. MC-3	291 ton	18.00	22.00
38. Base treatment, MC-0	155 ton	18.00	22.00
39. Seal coat, RC-2	103 ton	18.00	25.00
40. Processing roadway	89,000 s. y.	.06	.06
41. Sand	100 ton	1.00	2.00
42. Watering (base)	260 M gal.	1.00	2.00
43. Roller operation, base	130 hr.	3.00	3.50
44. Treated timber	69.07 M b. m.	150.00	135.00
45. Untreated timber	1.793 M b.m.	150.00	135.00
46. Treated timber piling	1,984 l. f.	1.25	1.50
47. Pile shoes	20 ea.	5.00	6.00
48. Dry excavation for bridges	10 c. y.	4.00	2.00
49. Wet excavation for bridges	190 c. y.	6.00	4.00
50. Class B concrete	27.7 c. y.	20.00	30.00
51. Old road obliteration	0.2 mi.	100.00	200.00
52. Standard right-of-way fence	68,000 l. f.	.075	.05
53. End panels	85 ea.	7.00	7.00
54. Brace panels	165 ea.	4.00	5.00
55. Remove and reset telephone line	1.8 mi.	100.00	100.00
56. 16-ft. telephone poles	15 ea.	1.50	10.00
57. 30-ft. telephone poles	4 ea.	2.00	15.00

HIGHWAY, MARYLAND

OWNER: State Roads Commission of Maryland, Baltimore.

PROJECT: Construction of 3.493 miles of dual-type highway in connection with relocation of North Point Road from Wise Avenue to point near Moffett Avenue, Baltimore, Md. Involves grading, drainage structures, macadam base course, and asphaltic concrete surface course.

CONDITIONS: Contractor to furnish all materials. Rail and highway transportation facilities available. Minimum wage rates specified are: skilled labor, 70c. per hr.; semi-skilled, 55c.; and common, 40c.

BIDS: Six bids were received January 26, 1942, ranging from the low of $434,443 to $492,294.

LIST OF BIDDERS:

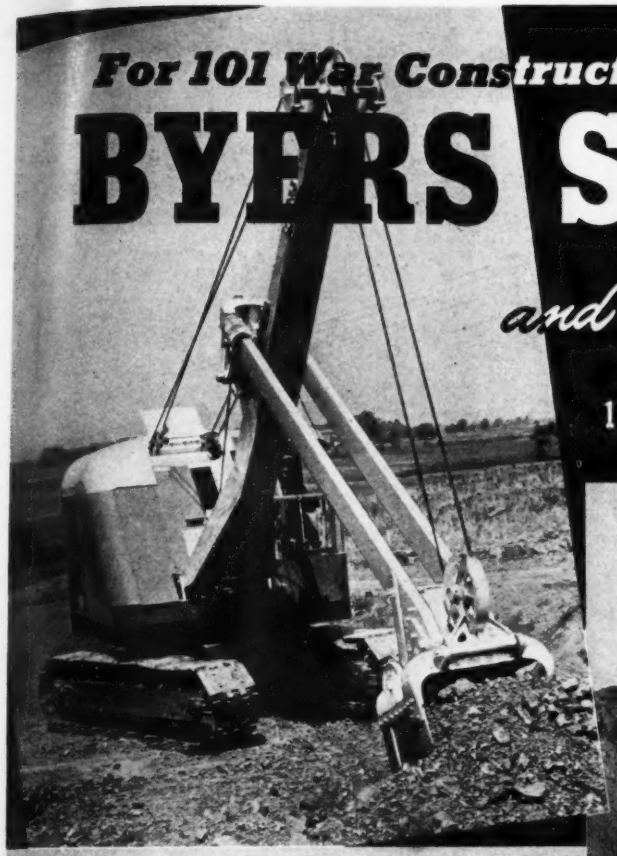
1. Williams Constr. Co., Middle River, Md. (low) $434,443
2. C. J. Langenfelder & Son, Rosedale, Md. 443,005
3. Leo J. McCourt, Baltimore, Md. 450,953
4. Thomas, Bennett & Hunter, Inc., Westminster, Md. 454,874
5. Frank Carozza, Baltimore, Md. 464,126
6. John Ensey, Baltimore, Md. 492,294

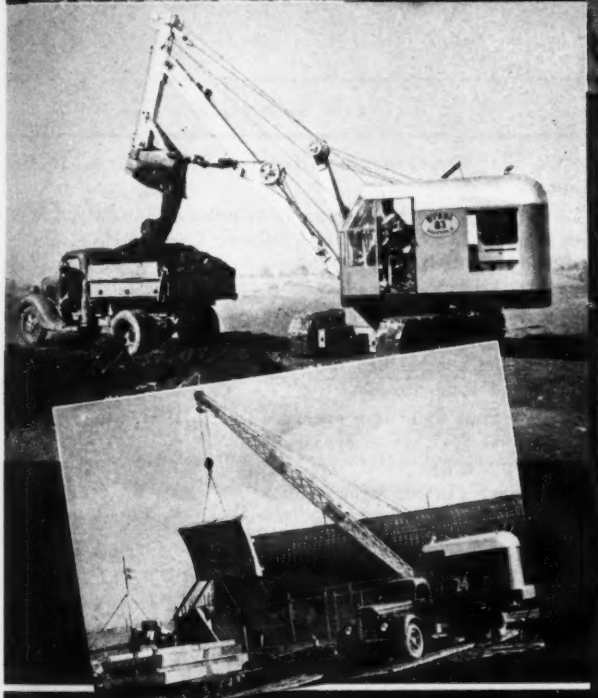
Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	L. S.	$2,500.00	$9,000.00	$1,000.00
2. Class 1 excavation	73,300 c. y.	.35	.38	.33
3. Class 2 excavation	7,050 c. y.	1.00	.80	.80
4. Class 3 excavation	300 c. y.	2.50	1.75	1.50
5. Class 5 excavation	2,000 c. y.	.50	.70	3.00
6. Borrow excavation	124,000 c. y.	.55	.48	.44
7. Tamped fill	2,300 c. y.	1.00	.70	.50
8. Earth shoulders	2,250 s. y.	.15	.15	.10
9. Seeding and mulching	49,000 s. y.	.20	.23	.22
10. Furn. and place topsoil	59,100 s. y.	.25	.30	.30
11. Sodding	6,500 s. y.	.30	.28	.25
12. Trim existing ditches	500 l. f.	.25	.15	.20
13. Remove existing masonry	10 c. y.	10.00	8.00	5.00
14. 3-in. waterbound mac. sub-base	104,800 s. y.	.34	.39	.32
15. 3-in. pen. macadam sub-base	104,800 s. y.	.35	.41	.31
16. 5-in. macadam base course	6,000 s. y.	.60	.70	.42
17. Stabilized shoulders	44,400 s. y.	.38	.35	.18
18. Stabilized base course	875 ton	1.50	1.75	1.60
19. Calcium chloride	75 ton	35.00	35.00	30.00
20. Pen. macadam surf. course	6,000 s. y.	.35	.70	.80
21. Material: penetration macadam	225,500 gal.	.11	.105	.10
22. Bitum. surf. crse. (Spec. B.)	104,800 s. y.	.45	.40	.51
23. Asph. conc. base course (Spec. B)	104,800 s. y.	.65	.65	.72
24. 8-in. perf. vit. clay or conc. pipe underdrain	13,850 l. f.	.50	.60	.50
25. 8-in. vit. clay or conc. pipe underdr. outlets	750 l. f.	.50	.60	.55
26. 8-in. 45-deg. v. c. or conc. elbow underdrain	24 ea.	1.00	2.50	1.00
27. 12-in. rein. concrete pipe	304 l. f.	1.25	1.50	1.35
28. 15-in. rein. conc. pipe	2,247 l. f.	1.60	1.75	1.50
29. 18-in. rein. conc. pipe	884 l. f.	2.10	2.20	1.95
30. 24-in. rein. conc. pipe	390 l. f.	3.00	3.00	2.75
31. 30-in. rein. conc. pipe	205 l. f.	4.00	3.75	3.50
32. 36-in. rein. conc. pipe	385 l. f.	5.00	4.75	4.75
33. 15-in. rein. conc. pipe elbow, 90-deg.	4 ea.	8.00	7.00	5.00
34. 15x18-in. tee section, rein. conc. pipe	1 ea.	14.00	11.00	8.00
35. 15x24-in. as above	2 ea.	20.00	16.00	12.00
36. 15x36-in. as above	1 ea.	40.00	32.00	25.00
37. 18x30-in., 45-deg. conc. pipe wye branch	1 ea.	30.00	24.00	18.00
38. Relaid pipe (any size)	100 l. f.	1.50	1.00	1.00
39. Untr. Cl. B timber piles	4,025 l. f.	1.00	.70	1.00
40. Cl. A conc., pipe endwalls	140 c. y.	30.00	32.00	25.00
41. Class A concrete	490 c. y.	25.00	26.00	23.00
42. Reinforcing steel bars	54,200 lb.	.07	.055	.04
43. Damp-proofing (Sta. 307)	L. S.	300.00	260.00	450.00
44. Aggregate backfill, underdrain	3,375 c. y.	3.30	2.25	1.50
45. 5-in. plain cement curb and gutter	575 s. y.	2.75	3.00	2.10
46. 8x18-in. white cem. conc. curb, type D	1,070 l. f.	2.00	2.75	40.00
47. Guard rail (4 cable)	3,540 l. f.	.75	.80	.73
48. Guard rail (2 cable)	180 l. f.	.65	.70	.65
49. End anchorages	30 ea.	25.00	30.00	25.00
50. Maintenance of traffic	L. S.	2,000.00	1,500.00	400.00

For 101 War Construction Jobs, Investigate

BYERS SHOVELS *and* CRANES

10 MODELS IN THE *Portable* SIZES





Types . . . . Full crawler or rubber mounted.

Shovel Capacities . . ⅜ yd.-½ yd.-⅝ yd.-¾ yd.

Crane Safe Lifting Capacities . . . . 4400 lbs. to 15,000 lbs. at 75% of tipping load.

Draglines . . . . . Extra long crawlers, extra wide treads available.

Trench Hoes . . Solid or bottom dump buckets, 25″ to 44″ wide.

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RAVENNA, OHIO

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HIGHWAY, UTAH

OWNER: Utah State Road Commission, Salt Lake City. E. C. Knowlton, state road engineer.

PROJECT: Construction of concrete and plant mix bituminous surfaced state highway from Draper Cross Roads to Lehi in Salt Lake and Utah Counties. Length of project 3.784 miles; roadway width, 48-ft.

CONDITIONS: Contractor to furnish all materials and complete work in 140 working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 80c. to $1.10 per hr.; semi-skilled, 65c.; and common, 50c.

BIDS: Six bids were opened May 19, 1941, ranging from the contract low of $162,969 to $176,487. Estimate, $148,090.

LIST OF BIDDERS:

1. W. E. Ryberg Co., Salt Lake City, Utah (contract) ... $162,969
2. W. W. Clyde & Co., Springville, Utah ... 167,823
3. Mullins & Wheeler, Salt Lake City, Utah ... 168,610
4. Strong & Grant, Springville, Utah ... 169,892
5. Ora Bundy, Ogden, Utah ... 173,843
6. Northwestern Engineering Co., Rapid City, S. Dak ... 176,487

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Concrete pavement	49,000 s. y.	$1.97	$2.20	$2.00
2. Plant-mixed bitum. surf	9,745 ton	1.79	1.75	1.98
3. Bituminous mat'l, Type SC-6	95,600 gal.	.08	.07	.08
4. Bituminous mat'l, Type RC-4	17,870 gal.	.08	.085	.085
5. Bituminous mat'l, Type MC-1	35,540 gal.	.09	.085	.09
6. Cover material	900 ton	2.00	1.60	2.75
7. Cr. rock or cr. gravel surf. crse	32,270 ton	.40	.35	.54
8. Unclassified excavation	10,000 c. y.	.40	.25	.38
9. Overhaul, Class A	52,500 sta. y.	.02	.015	.015
10. Overhaul, Class B	1,450 y. mi.	.15	.20	.15
11. Watering	300 M gal.	1.00	1.50	1.50
12. Rolling	250 hr.	2.58	3.50	2.50
13. 8-in. corr. galv. metal pipe	266 l. f.	1.20	1.10	1.15
14. 12-in. corr. galv. metal pipe	52 l. f.	1.50	1.40	1.40
15. Embankment protectors	5 ea.	17.85	25.00	20.00
16. Structure excavation	175 c. y.	1.50	1.00	1.40
17. Remove existing structures	11,400 s. y.	.49	.50	.50
18. Obliterate old road	0.8 mi.	200.00	200.00	300.00
19. Concrete, Class A	6 c. y.	30.00	25.00	27.50
20. Reinforcing steel	325 lb.	.08	.08	.10
21. Structural steel	300 lb.	.15	.15	.15
22. Guard rail	4,746 l. f.	1.25	1.50	1.27
23. 6-in. underdrains	470 l. f.	.46	.50	.50

ACCESS ROAD, YPSILANTI, MICHIGAN

OWNER: Michigan State Highway Dept., Lansing, in cooperation with the Defense Public Works Agency.

PROJECT: Construction of access road for U. S. Army Bomber Plant near Ypsilanti, Van Buren Township, Wayne County, Mich. Commences at point on south side of Existing M-17 (Ecorse Rd.) about 127-ft. south of intersection of M-17 and M-56 (Belleville Rd.), then west along south side of present M-17 to point on west county line, north of the bomber plant. Type of work: 42-ft. grade; grading and drainage structures; and 22-ft. concrete pavement, 9-in. uniform, not reinforced. Approximate length, 3 miles.

CONDITIONS: Contractor to furnish all materials and complete work by January 1, 1942. The speed with which the work must be performed necessitates winter construction. Cold weather protection for pavement concrete includes calcium chloride admixture, heating aggregates and mixing water, paper blanket covering, and straw or hay covering. Rail and highway transportation facilities available. Wage rates specified as minimums are: skilled labor, $1.37½ to $1.62½ per hr.; intermediate labor, 90 to 92½c.; and unskilled labor, 60 to 80c. per hr.

BIDS: Six bids were opened October 18, 1941, ranging from the low of $236,807 to $324,299.

LIST OF BIDDERS:

1. Bridgeport Core Sand Co., and Thomas McNally, Saginaw, Mich. (contract) ... $236,807
2. Cooke Contracting Co., Detroit, Mich. ... 278,481
3. Lewis & Frisinger Co., and E. B. Schwaderer, Ann Arbor, Mich. ... 287,292
4. Loselle Constr. Co., Wyandotte, Mich. ... 311,071
5. L. A. Davidson, Lansing, Mich. ... 315,197
6. Denton Constr. Co., Detroit, Mich. ... 324,299

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	4.02 ac.	$100.00	$100.00	$100.00
2. Grubbing	505 s. rd.	.75	1.00	1.00
3. Remove trees 8 to 12-in. dia.	11 ea.	10.00	10.00	10.00
4. Remove trees 13 to 24-in. dia.	22 ea.	15.00	15.00	15.00
5. Remove trees 25 to 36-in. dia.	12 ea.	25.00	25.00	30.00
6. Remove old pavement	718 s. y.	.38	1.00	.30
7. Remove masonry and concrete	400 c. y.	3.00	3.00	3.00
8. Earth excavation	155,254 c. y.	.20	.27	.30
9. Overhaul	376,825 c. y. mi.	.09	.10	.12
10. Trim and finish earth grade (service road)	48.4 sta.	10.00	10.00	5.00
11. Trim and finish earth grade	163.41 sta.	10.00	10.00	5.00
12. Grade A concrete	609.3 c. y.	21.00	25.00	20.00
13. Steel reinforcement	20 355 lb.	.06	.06	.10
14. Heat and house concrete	609.3 c. y.	3.00	5.00	3.00
15. 12-in. Cl. A culverts	723 l. f.	1.20	1.25	1.25
16. 12-in. Cl. B culverts	57 l. f.	1.20	1.50	1.25
17. 18-in. Cl. B culverts	160 l. f.	2.25	2.00	2.00
18. 24-in. Cl. B culverts	28 l. f.	3.00	3.00	3.00
19. 30-in. Cl. B culverts	204 l. f.	5.00	5.00	3.50
20. 12-in. sewer	274 l. f.	1.10	1.50	1.10
21. 6-in. edgedrain sewer	2,000 l. f.	.50	.50	.75
22. Catch basin, type 3E	1 ea.	75.00	75.00	75.00
23. Catch basin, type 5E	1 ea.	60.00	65.00	75.00
24. Catch basin, type 6D	1 ea.	60.00	65.00	75.00
25. Reconstr. catch basin, Cover A	1 ea.	35.00	40.00	20.00
26. Fine grading and cleanup	163.41 sta.	6.00	10.00	15.00
27. Fine grading and cleanup (service road)	48.4 sta.	6.00	10.00	15.00
28. Concrete pavement, 9-in. uniform	38,141.8 s. y.	2.25	2.80	2.80
29. Concrete pavement, 7-in. uniform	5,483.4 s. y.	2.00	2.55	2.40
30. Steel tie bars, ½-in. dia.	15,217 lb.	.06	.06	.05
31. Hay or straw	300 ton	15.00	12.00	16.00
32. Stab. aggregate surf., plant mix, 5-in. comp.	11,828 s. y.	.50	.40	.40
33. Heat aggregates and mixing water	43,625 s. y.	.20	.10	.15
34. Calcium chloride, admixed	4 ton	25.00	25.00	25.00
35. Calcium chloride (dry powder)	58.2 ton	25.00	25.00	25.00
36. Concrete curve header	120 l. f.	1.25	1.50	1.00
37. Aggregate approach (loose meas.)	1,119 c. y.	1.75	2.50	1.00
38. Gravel shoulders, 4-in. compacted	37,208 s. y.	.28	.30	.25
39. Topsoil surface (loose meas.)	15,000 c. y.	.35	.50	.30
40. Bitum. approach mixture	663.9 ton	7.50	6.00	8.00
41. Plain riprap	24 c. y.	4.00	10.00	6.00
42. Guard posts	18 ea.	1.50	1.50	2.00
43. Conc. rt.-of-way markers	24 ea.	5.00	5.00	4.00
44. Maintain traffic (1 intersection)	1 ea.	500.00	300.00	100.00
45. Bridge over pavement	3 ea.	75.00	350.00	100.00
46. Moving fence	200 rd.	.70	1.50	1.00
47. Mulching	98 ton	14.00	14.00	10.00
48. Fertilizer	9,750 lb.	.05	.05	.05
49. Class B seeding	32.5 ac.	50.00	60.00	25.00

HIGHWAYS, MICHIGAN

OWNER: Michigan State Highway Dept., Escanaba; Ben Sparks, engineer.

PROJECT: Concrete paving 7.944 miles of State Road M-28 west from U. S. Route 2 in Chippewa County, Mich. Pavement width 22-ft.

CONDITIONS: Contractor to furnish all material and complete work by Jan. 1, 1942. Highway transportation facilities available. Local material, such as sand and gravel to be used. Wage rates are: skilled labor, $1.12½ per hr.; semi-skilled, 75c.; and common, 50c.

BIDS: Four bids were opened July 23, 1941, ranging from the low of $187,240 to $195,543.

LOW BIDDERS:

1. Wilmer Pierson, Saginaw, Mich. ... $187,240
2. Loselle Constr. Co., Wyandotte, Mich. ... 187,699
3. Bacco Constr. Co., Iron Mountain, Mich. ... 190,320

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Overhaul	38,807 c.y.sta.	$0.005	$0.005	$0.005
2. Overhaul	4,337 c.y.mi.	.12	.10	.05
3. Fine grading	420.83 sta.	8.00	3.00	3.00
4. Paving reinforcement	103,474.4 s.y.	.23	.22	.22
5. Concrete pavement, 9-7-9-in	103,474.4 s.y.	1.40	1.47	1.50
6. Concrete curve header	99 l.f.	1.00	1.00	1.00
7. RR track encasement, Grade A conc	26 c.y.	12.00	14.00	10.00
8. Aggregate approaches (loose meas.)	1,379 c.y.	1.75	1.25	1.25
9. Clay surface (loose meas.)	8,515 c.y.	.50	.35	.40
10. Bituminous approach mixture	412.6 ton	6.00	5.00	6.00
11. Cable guard rail	110 l.f.	.55	.60	.50
12. Cable expansion takeups	4 ea.	8.00	6.00	5.00
13. Braced end panels	4 ea.	15.00	15.00	10.00
14. Guard posts	42 ea.	1.25	1.00	1.00
15. Conc. project markers, 1 plate	2 ea.	15.00	15.00	25.00
16. Obliterate abandoned road	0.3 ac.	50.00	30.00	50.00
17. Final trim and clean up	420.83 sta.	8.00	5.00	3.00
18. Bridges over pavement	2 ea.	100.00	75.00	100.00
19. Concrete end header	22 l.f.	1.00	1.00	1.00

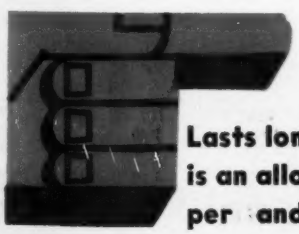
HIGHWAYS need interceptors, too!

• *Installation of Corrugated Metal Pipe is quick and easy, from simple designs.*

JUST as interceptor planes are needed to meet the enemy before it locates and destroys its objective, so, also, do many highways need interceptors — perforated drains in cuts, shallow fills and side hill slopes —to collect harmful ground water before it weakens the highway foundation.

Above is a typical example of a Corrugated Perforated Pipe installation that gives soil stabilization in a highway cut. The long lengths and tightly connected joints of the pipe, plus its great strength, assures perfect and permanent alignment. The perforations were designed to permit rapid infiltration of ground water, yet their size and shape prevent choking from backfills. In this particular installation the interceptor drainage will have long life because the pipe is of Toncan Copper Molybdenum Iron . . . the most rust-resistant ferrous metal in its price class.

Iron and steel are vital metals, more especially now, and *Production for Victory* must come first. Eventually, however, Corrugated Metal Pipe will again be freely available for drainage systems everywhere. Remember the many distinct advantages of this modern drainage pipe. The Toncan Culvert Manufacturers Association, Republic Building, Cleveland, Ohio.



Lasts longer because it is an alloy of iron, copper and molybdenum

TONCAN IRON

PRODUCT OF REPUBLIC STEEL

HIGHWAY IMPROVEMENTS, OHIO

OWNER: Ohio State Highway Department, Columbus, Ohio.

PROJECT: Grading, drainage structures, concrete box culverts, bridge, roadside improvement, and reinforced concrete paving 9.092 miles of highway in Montgomery County, Ohio. Sections to be improved, F (pt.) and G, are on direct north and south highway near Dayton, U. S. Route 25, which carries heavy defense traffic from Toledo and Detroit. Portion of construction is two pavements of 24-ft. each, and portion to be from 46 to 51-ft. wide.

CONDITIONS: Contractor to furnish all materials and complete work by December 31, 1942. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.25 to $1.75 per hr.; semi-skilled, 87¢ to $1.25; and common, 70¢.

BIDS: Four bids were received December 16, 1941, ranging from the contract low of $1,217,716 to $1,327,206. Engineer's estimate, $1,267,000.

LIST OF BIDDERS:

1. Carl Myers & Pierce Constr. Co. Toledo, Ohio (contract) $1,217,716
2. Contractors Finance Corp., Cincinnati, Ohio..... 1,225,520
3. White Consolidated, Inc., Chicago, Ill..... 1,317,001
4. A. J. Baltes, Norwalk, Ohio..... 1,327,206

Roadway

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Roadway excavation, unclassified	635,455 c. y.	$0.30	$0.34	$0.33
2. Borrow (contractor to furnish)	14,411 c. y.	.30	.45	.40
3. Remove, dispose exist. conc. pavmt.	1,047 s. y.	.35	.35	.25
4. Remove, dispose exist. conc. base	9,072 s. y.	.35	.35	.25
5. Remove for re-use exist. brick wear. surf.	10,899 s. y.	.20	.30	.50
6. Remove exist. conc. curb and gutter.	6,198 l. f.	.15	.10	.15
7. Water (estimated)	3,655 M gal.	1.25	2.00	3.00
8. Remove, dispose 4- to 24-in. pipe	1,443 l. f.	.50	.25	.45
9. Remove, store 8- to 15-in. corr. met. pipe	283 l. f.	.50	.40	.72
10. Remove, store 30-in. corr. met. pipe	97 l. f.	1.00	.60	1.35
11. Remove and store 12-in. ci. pipe	16 l. f.	.75	1.00	1.35
12. Remove for re-use 36-in. pipe	181 l. f.	1.00	1.00	1.80
13. Remove for re-use 60-in. pipe	264 l. f.	2.50	3.00	3.60
14. 8-in. corr. metal pipe, for driveways	24 l. f.	1.25	1.25	.90
15. 12-in. corr. metal pipe, for driveways.	134 l. f.	1.64	1.50	1.20
16. 15-in. corr. metal pipe, for driveways.	52 l. f.	2.00	2.00	1.40
17. 18-in. corr. metal pipe, for driveways.	26 l. f.	2.30	2.50	1.80
18. 30-in. corr. metal pipe, for driveways.	36 l. f.	4.20	4.50	3.60
19. 54-in. corr. metal pipe, for driveways.	124 l. f.	9.25	9.00	9.00
20. 37x21-in. corr. met. arch with integral base	30 l. f.	8.25	10.00	5.40
21. 6-in. plain cem. conc. pipe, storm sewers	10 l. f.	.95	.50	9.00
22. 12-in. as above	1,889 l. f.	1.15	.90	1.15
23. 15-in. as above	908 l. f.	1.70	1.15	1.40
24. 18-in. as above	1,891 l. f.	2.00	1.75	2.00
25. 24-in. as above	3,807 l. f.	2.50	2.40	2.90
26. 30-in. rein. conc. pipe, storm sewers	357 l. f.	4.10	5.00	4.00
27. 10-in. rein. con. pipe, storm sew. under pavmt	76 l. f.	1.50	1.40	1.60
28. 12-in. as above	2,819 l. f.	1.55	1.50	1.80
29. 15-in. as above	1,431 l. f.	2.25	1.75	2.15
30. 18-in. as above	529 l. f.	2.45	2.25	2.50
31. 24-in. as above	641 l. f.	3.20	3.50	3.35
32. 30-in. as above	230 l. f.	4.35	4.50	4.50
33. 36-in. as above	14 l. f.	5.50	6.00	5.85
34. 60-in. as above	1,182 l. f.	13.00	14.00	13.50
35. 60-in. rein. conc. pipe, storm sewers under pavmt., spec. joints	102 l. f.	14.00	16.00	15.75
36. 8-in. pl. cem. conc. pipe, storm sew., bottom half sealed only, porous bkfill	357 l. f.	1.00	.80	1.15
37. 10-in. as above	255 l. f.	1.10	1.00	1.45
38. 12-in. as above	675 l. f.	1.35	1.15	1.60
39. 15-in. as above	426 l. f.	1.80	1.50	2.00
40. 18-in. as above	349 l. f.	2.05	1.80	2.70
41. 10-in. rein. conc. pipe, storm sew., bottom half sealed only, porous bkfill	20 l. f.	1.60	1.50	2.00
42. 15-in. as above	6 l. f.	2.35	2.50	2.70
43. 18-in. as above	10 l. f.	2.55	3.00	3.40
44. 6-in. ext. qual. drain tile, or p. c. c. pipe for roadway drainage	4,032 l. f.	.90	.45	.65
45. 12-in. b. and s. pl. cem. conc. pipe, rd. dr.	388 l. f.	1.35	.75	1.35
46. 6-in. ex. qual. dr. tile, or p. c. c. pipe, underdrain	31,291 l. f.	.90	.60	.90
47. 6-in. b. and s. rein. conc. pipe, pvmt. underdr.	1,143 l. f.	1.20	1.00	1.58
48. 6-in. 45-deg. bend pipe spec.	20 ea.	3.00	2.50	2.25
49. 6-in. 90-deg. bend pipe spec.	21 ea.	3.00	3.00	2.25
50. 6x6-in. wye pipe special	1 ea.	3.00	5.00	2.25
51. 24x15-in. wye pipe special	1 ea.	18.00	25.00	18.00
52. 60x12-in. tee pipe special	3 ea.	75.00	80.00	81.00
53. 36-in. pipe relaid with spec. joint	169 l. f.	1.65	2.00	3.60
54. 60-in. pipe relaid with spec. joint	240 l. f.	4.00	3.00	7.20
55. Std. No. 3 manholes	22 ea.	350.00	200.00	225.00
56. Special manhole	1 ea.	550.00	400.00	250.00
57. Standard No. 1 manholes	20 ea.	185.00	150.00	135.00
58. Std. No. 2 manholes, without drops	2 ea.	250.00	200.00	180.00
59. Std. No. 1-2 catch basins, modified	89 ea.	60.00	40.00	84.00
60. Standard No. 2-2 catch basins	2 ea.	50.00	40.00	63.00
61. Std. No. 1-3 catch basin, modified	3 ea.	80.00	80.00	67.50
62. Std. No. 1-3 catch basin	1 ea.	70.00	75.00	67.50
63. Std. No. 3 catch basins	49 ea.	150.00	100.00	135.00
64. Std. No. 3-A catch basins	1 ea.	150.00	150.00	125.00
65. Std. No. 1 side ditch inlets	3 ea.	30.00	35.00	45.00
66. Reset manhole castings to grade	8 ea.	5.00	5.00	25.00
67. 12-in. type A riprap	53 s. y.	4.00	4.00	2.75
68. 4-in. conc. sidewalks (1 crse. const.)	21,988 s. f.	.25	.25	.17
69. Conc. steps, 6-in. riser, 18-in. tread	13.5 l. f.	2.50	1.50	5.00
70. Conc. steps, 7-in. riser, 15½-in. tread	6 l. f.	2.50	1.50	9.00
71. Conc. steps, 5-in. riser, 15-in. tread	21 l. f.	1.75	1.50	4.00
72. Conc. steps, 4-in. riser, 12-in. tread	16 l. f.	1.00	1.50	4.00
73. Paved gutter, type 3	326.5 l. f.	3.00	2.00	.60
74. Paved gutter, special	974 l. f.	1.25	3.00	1.14
75. Guard rail, std. str. flexible steel plate tens. type	14,832 l. f.	1.00	1.00	.80
76. Guard rail, multiple-cable type	4,592 l. f.	.82	1.25	.80
77. Remove and store guard rail	557 l. f.	.20	.30	.50
78. Remove and rebuild guard rail	56 l. f.	.60	.80	1.00
79. Seed and protect roadway areas	606,096 s. y.	.04	.055	.05
80. Classified embank. mat'l (blanket course)	64,184 c. y.	.60	.50	.75
81. Abandon exist. manholes, catch basins, inlets	36 ea.	15.00	15.00	3.35
82. 6-in. concrete revetment	314.6 s. y.	2.75	3.00	2.50
83. Fence	62,331.8 l. f.	.24	.25	.20
84. Traffic bound surf. crse., temp. rdway.	600 ton	2.00	2.00	3.50
85. Traffic compacted surf. crse.	850 c. y.	2.25	2.00	4.00
86. Calcium chloride, temp. roadway	8 ton	30.00	40.00	40.00

Roadside Improvement

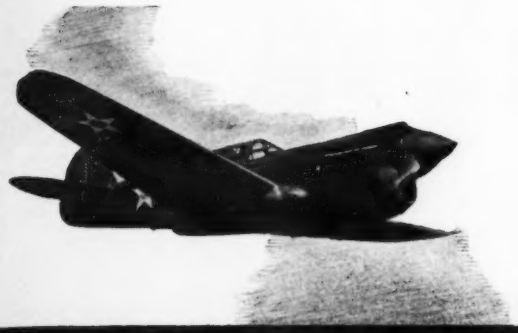
Item	Quan.	Unit Prices (1)	(2)	(3)
87. Riprap for tree protection (stone)	420 s. y.	4.00	3.00	2.50
88. Aggregate for tree root aeration	570 c. y.	2.00	2.25	2.00
89. Commercial fertiliser (4–12–4)	113,809 lb.	.02	.03	.02
90. Sodding	26,175 s. y.	.25	.25	.28
91. Hall Japanese Honeysuckle (2 yr.)	5,587 ea.	.25	.50	.50
92. Chinese Matrimony vine (2 to 3-ft.)	2,128 ea.	.30	.50	.75
93. Bigleaf Wintercreeper (18 to 24-in.)	214 ea.	1.00	1.25	1.50
94. Glossy Wintercreeper (18 to 24-in.)	372 ea.	.95	.80	2.00
95. Spreading Euonymus (18 to 24-in.)	59 ea.	1.00	1.00	2.25
96. Japanese Barberry (2 to 3-ft.)	198 ea.	.75	1.00	1.25
97. Japanese Barberry (18–24-in., hvy.)	1,850 ea.	.80	.75	1.00
98. Meintor Barberry (18 to 24-in.)	438 ea.	.80	1.00	2.00
99. Slender Deutzia (18 to 24-in.)	240 ea.	.75	1.00	1.50
100. Winged Dwarf Euonymus (18-24-in.)	51 ea.	.90	2.50	1.75
101. Thunberg Spiraea (2 to 3-ft.)	91 ea.	.80	1.00	1.25
102. Regel Privet (3 to 4-ft.)	77 ea.	1.00	1.25	1.50
103. Meadow Rose (18 to 24-in.)	102 ea.	.75	.75	1.25
104. Bristly Rose (18 to 24-in)	67 ea.	.80	.75	1.25
105. Five-leaved Aralia (3 to 4-ft.)	60 ea.	.90	1.00	1.50
106. Arrowood (4 to 5-ft.)	23 ea.	1.20	1.25	2.00
107. American or White Ash (2 to 2½-in. cal.)	21 ea.	9.00	12.00	8.00
108. American Planestree (2 to 2½-in. caliper)	33 ea.	10.00	12.00	8.00
109. American Linden (2 to 2½-in. caliper)	33 ea.	10.00	15.00	7.50
110. Austrian Pine (8 to 10-ft.) balled, burlapped	24 ea.	15.00	20.00	20.00
111. Mulching (straw)	26,175 s. y.	.02	.03	.01

Pavement

Item	Quan.	Unit Prices (1)	(2)	(3)
112. 6-in. portland cem. conc. base crse	286.7 s. y.	2.00	1.50	1.80
113. 7-in. rein. port. cem. conc. base crse.	638.9 s. y.	2.15	1.75	2.10
114. Coarse aggr. for waterbound mac. base course	832 ton	3.50	2.00	2.00
115. Screenings, waterbd. mac. base crse.	305 ton	3.50	2.00	2.00
116. 4½-in. min. thickness port. cem. conc. base course	68.8 c. y	10.00	12.00	11.00
117. Aggregate, surf. trtmt.: No. 46	124 ton	3.50	2.00	4.50
118. Bitum. matl. for seal coat	1,397 gal.	.20	.20	.15
119. Bitum. matl. for prime coat	1,956 gal.	.20	.20	.15
120. Surf. trtmt. bitum. material	3,351 gal.	.20	.20	.15
121. 9–7–7–9-in. port. cem. conc. pavmt.	6,519.6 s. y.	2.00	1.70	2.00
122. 9–6–6–9-in. port cem. conc. pavmt.	14,874.4 s. y.	1.90	1.60	1.91
123. 6-in. port. cem. conc. pavmt	1,284 s. y.	1.90	1.50	1.90
124. 9–7–7–9-in. rein. port. cem. conc. pav.	205,039.5 s. y.	2.00	1.95	2.17
125. 9–7–7–9-in. red. rein. port. cem. conc. pavmt	61,573.4 s. y.	2.15	2.20	2.30
126. 5-in. min. thick. rein. port. cem. conc. pavmt	471.1 c. y.	10.00	12.00	11.00
127. As above, red	32 c. y.	14.00	12.00	15.00
128. Salvage brick wearing surface	1,374.3 s. y.	1.20	.75	2.00
129. 12x4-in. flush conc. curb	64.07 l. f.	.40	1.00	1.00
130. Type 4-A concrete curb	32,746.1 l. f.	.25	.20	.15
131. Type 4-B concrete curb	619.86 l. f.	.50	1.00	.15
132. Type D conc. curb, incl. dowels	45 l. f.	1.00	1.25	1.00
133. Traffic bound side approaches	967 c. y.	2.50	2.25	5.00
134. Bitum. matl. for bitum. trtmt. of rigid pavmt	463 s. y.	.10	1.00	.05
135. No. 6 aggr. for bitum. trting. rigid pavt	13 c. y.	2.50	3.00	3.50
136. No. 6 aggr. for surf. trtmt. (choke and cover aggr.)	49 ton	3.50	2.50	3.00

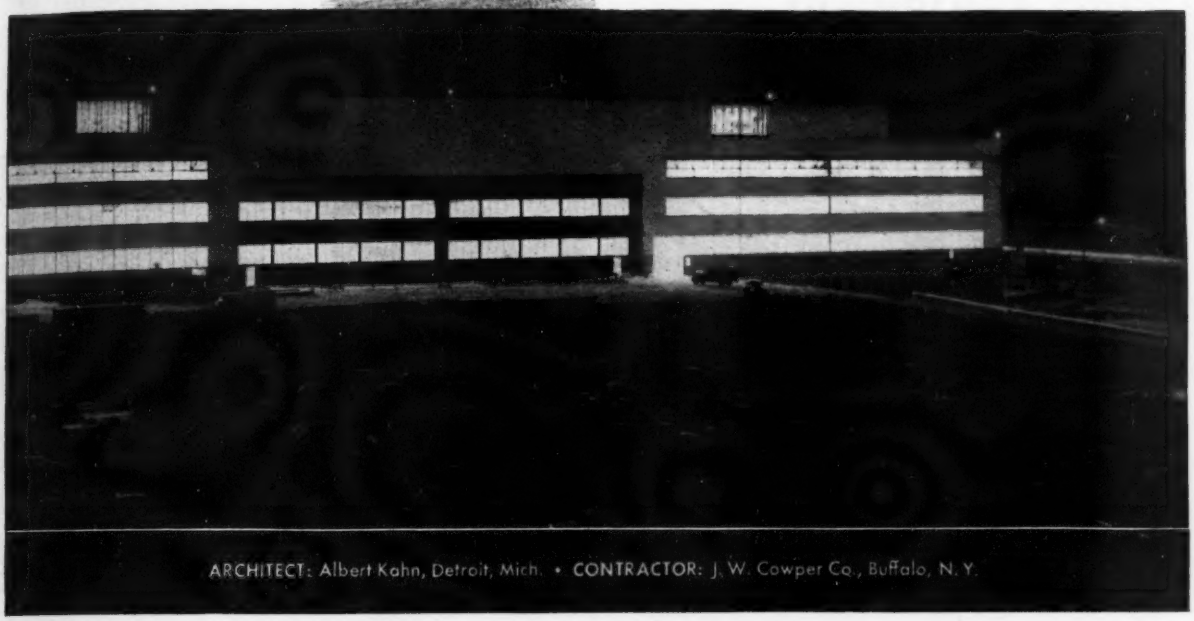
Structures—20-ft. Span and Under

Item	Quan.	Unit Prices (1)	(2)	(3)
137. Excav. for structures (unclassified)	4,934 c. y.	2.00	1.25	1.50
138. Channel excavation	3,078 c. y.	.75	.50	.80
139. Cl. C conc.: structures and plugging pipe	1,663 c. y.	27.00	22.00	25.50
140. Class G conc. for structures	12.3 c. y.	30.00	20.00	25.50
141. Waterproofing, type B	519 s. y.	1.50	1.00	1.20
142. Reinforcing steel	191,360 lb.	.06	.06	.058



TIME SAVED IS THE REAL "cost" YARDSTICK NOW

The P40E, a Curtiss-Wright pursuit plane.



ARCHITECT: Albert Kahn, Detroit, Mich. • CONTRACTOR: J. W. Cowper Co., Buffalo, N. Y.

Productive Time, not Dollars and Cents, is the Real Measure of Construction Costs These Days

If the country weren't in a life-and-death fight for its existence, the old yardstick of cost would be as good as ever.

But now, right now, speed is what matters most. More important than the actual expense of construction is the time gained for productive use—time you can measure in terms of guns, planes, tanks and other war material.

That's why concrete for wartime work should be made with Lehigh Early Strength Cement. In 24 to 48 hours it equals the strength of normal cement at 7 days. In ⅓ to ⅕ the normal time it produces concrete that's ready for use and "r'aring" to go.

We could cite case after case to prove that the use of Lehigh Early Strength Cement results in lower construction costs. But that's not so important now. What matters is the priceless time it saves; time, indeed, that will help add up to Victory.

Lehigh

EARLY STRENGTH CEMENT

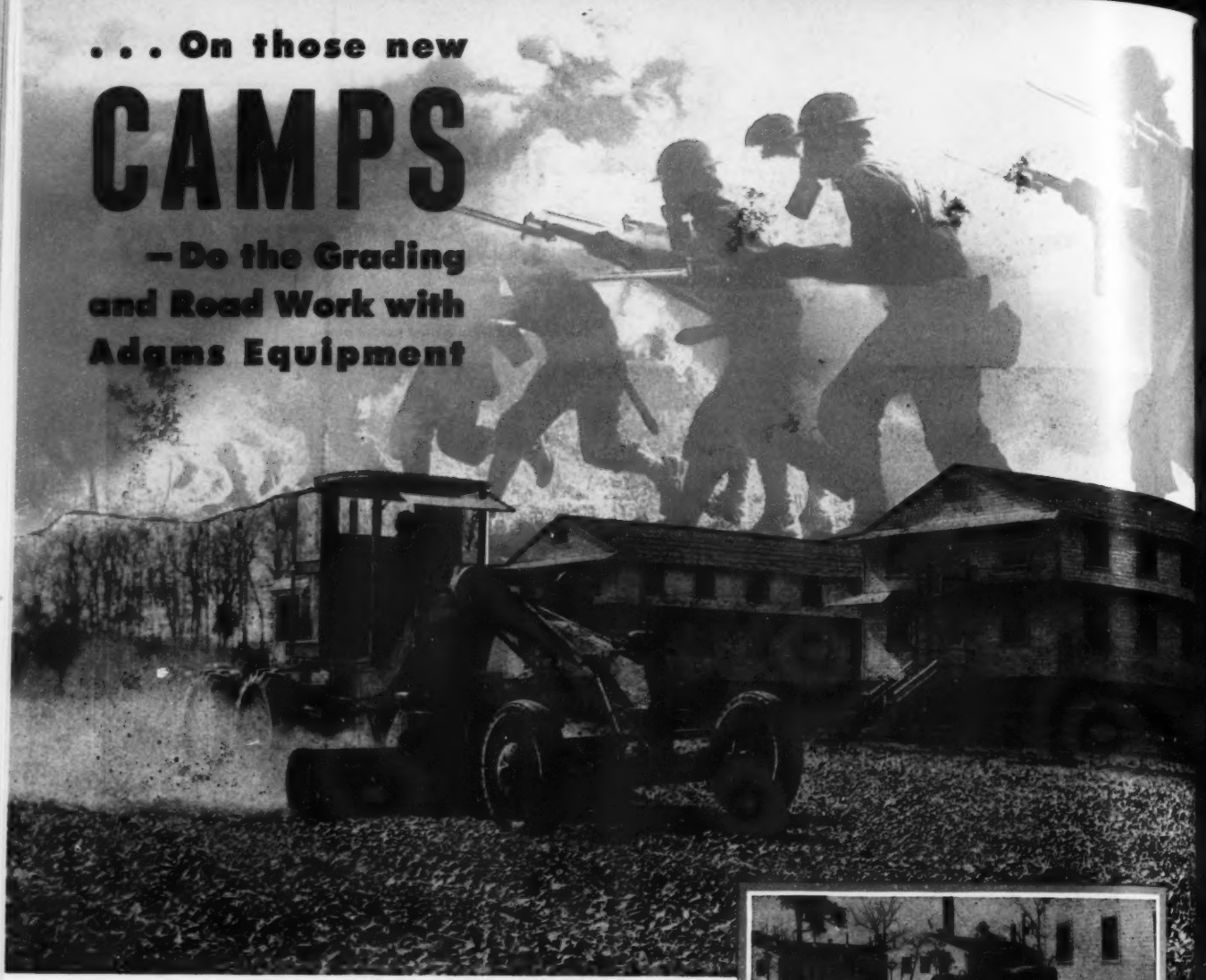
for **service-strength** concrete in a **hurry**

LEHIGH PORTLAND CEMENT COMPANY ★ ALLENTOWN, PA. ★ CHICAGO, ILL. ★ SPOKANE, WASH.

. . . On those new

CAMPS

—Do the Grading and Road Work with Adams Equipment

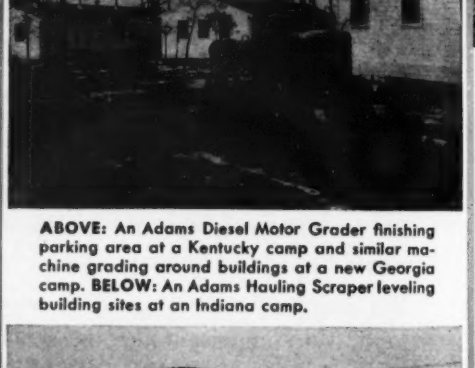


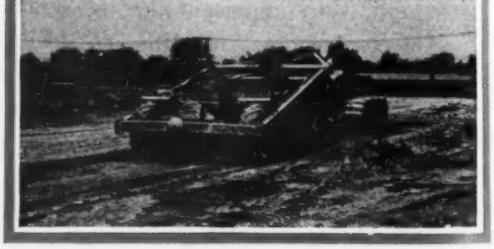
THE VARIETY of grading jobs incident to building or enlarging army camps is "right down the alley" of Adams equipment. For the leveling of building sites, and grounds generally, there are Adams Hauling Scrapers, available in several sizes, which do a "swell" job quickly and economically . . . For general grading, building roads and ditches, spreading or mixing material for parking areas, etc., there are several sizes of Adams Motor Graders which handle such jobs to perfection . . . Not only is Adams equipment practical and economical but it is dependable for "round the clock" performance.

Of course, camps constitute only one type of war projects on which hundreds of Adams machines are being used successfully. Whatever your grading or earth-moving problems, see your local Adams dealer now for needed equipment—he can be of valuable service to you.

J. D. ADAMS COMPANY, INDIANAPOLIS, INDIANA

Sales and Service Throughout the World





ABOVE: An Adams Diesel Motor Grader finishing parking area at a Kentucky camp and similar machine grading around buildings at a new Georgia camp. **BELOW:** An Adams Hauling Scraper leveling building sites at an Indiana camp.

USE THESE ADAMS MACHINES—Motor Graders in six models, Leaning Wheel Graders, Elevating Graders, Hauling Scrapers, Tamping Rollers, etc.

ON THESE DEFENSE JOBS—Airfields, camps, defense building sites, ammunition dumps, access roads, etc.

ADAMS

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT

143. ½-in. bitum. premolded exp. joint filler	240 s. f.	.25	.30	.15
144. 12-in. 24-oz. folded copper strip	219 l. f.	1.00	1.00	1.55
145. Remove portion of exist. structures	L.S.	100.00	500.00	900.00
146. Dowel holes, 1¼x4-in	14 ea.	1.00	1.00	.90
147. Remove existing structures	L.S.	1,300.00	500.00	350.00
148. 6-in. rein. conc. pipe: rdway. culverts	233 l. f.	1.05	1.10	1.10
149. 12-in. rein. conc. pipe: rdway. culverts	182 l. f.	1.25	1.50	2.00
150. 15-in. rein. conc. pipe: rdway. culverts	1,802 l. f.	2.00	1.75	2.50
151. 18-in. rein. conc. pipe: rdway. culverts	769 l. f.	2.25	2.25	2.90
152. 24-in. rein. conc. pipe: rdway. culverts	1,150 l. f.	3.00	3.50	4.50
153. 30-in. rein. conc. pipe: rdway. culverts	747 l. f.	4.25	4.25	6.00
154. 36-in. rein. conc. pipe: rdway. culverts	166 l. f.	5.50	5.50	8.15
155. 60-in. rein. conc. pipe: rdway. culverts	181 l. f.	13.00	14.00	17.00
156. 66-in. rein. conc. pipe: rdway. culverts	400 l. f.	15.00	16.00	20.00
157. 36-in. ext. str. rein. conc. pipe, rdway. culv	232 l. f.	5.85	5.50	10.15
158. 42-in. ext. str. rein. conc. pipe, rdway. culv	220 l. f.	7.50	8.00	12.00
159. 60-in. ext. str. rein. conc. pipe, rdway. culv	195 l. f.	14.00	15.00	21.35
160. 12-in. paved. bit. coat. c. m. pipe, rdway. culv	18 l. f.	2.00	2.50	2.40
161. 18x12-in. tee pipe special	1 ea.	11.00	10.00	14.50
162. 18x12-in. tee pipe special	2 ea.	11.00	10.00	16.00
163. 24x12-in. tee pipe special	4 ea.	18.00	10.00	27.00
164. 30x12-in. tee pipe special	1 ea.	30.00	15.00	36.00
165. 36x12-in. tee pipe special	1 ea.	32.00	20.00	38.50
166. 60x12-in. tee pipe special	1 ea.	100.00	75.00	100.00
167. 66x12-in. tee pipe special	1 ea.	150.00	75.00	168.00
168. 42x12-in. ex. str. tee pipe special	1 ea.	50.00	50.00	74.00
169. 60x12-in. ex. str. tee pipe special	1 ea.	110.00	80.00	129.00
170. ¾x13-in. expan. anchor bolts	14 ea.	1.25	1.00	2.40
171. 24-in. Calco automatic headgate	1 ea.	50.00	100.00	37.00

Structures—Over 20-ft. Span

Item	Quan.	Unit Prices (1)	(2)	(3)
172. Cofferdams and pumping	L.S.	300.00	2,500.00	2,200.00
173. Uncl. excavation, structures	455 c. y.	2.00	1.50	2.00
174. Channel excavation	2,642 c. y.	.75	.50	.90
175. Class C concrete, culvert	978 c. y.	22.00	22.00	21.60
176. Class C concrete, apron	37 c. y.	15.00	15.00	16.90
177. Type C waterproofing	71 s. y.	1.00	2.00	.50
178. Reinforcing steel (6x6-in. No. 4 gage welded wire mesh)	870 lb.	.10	.06	.06
179. Reinforcing steel	270,390 lb.	.06	.06	.058
180. Steel sheets, 18-gage	774 lb.	.25	.10	.15
181. Riprap	140 s. y.	3.00	3.00	3.00
182. Premium on industrial insurance	L.S.	10,000.00	38,000.00	15,000.00
183. Maintain traffic, incl. lights, signs, barricades and watchmen	L.S.	3,000.00	5,000.00	5,000.00

HIGHWAYS, NEW YORK

OWNER: Dept. of Public Works, Division of Highways, Albany, N. Y.

PROJECT: Grading, drainage structures, and reinforced concrete paving 7.83 miles of Danville-Mt. Morris State Highway in Livingston County, N. Y. Pavement is to be 8-7-8-in. concrete, reinforced.

CONDITIONS: Contractor to furnish all materials and complete work by December 1, 1942. Rail and highway transportation facilities available. Minimum wages stipulated are: skilled labor, 75c. per hr.; intermediate grade labor, 55c; and unskilled, 50c. Amount of structural steel, cast iron, and corrugated metal pipe required might seriously delay work, and tend toward raising cost of project.

BIDS: Two bids were opened December 18, 1941, the low of $712,328, and $732,797. Engineer's estimate, $744,208.

LIST OF BIDDERS:

1. Bero Engr. & Constr. Corp., North Tonawanda, N. Y. $712,328
2. D. W. Winkelman Co., Syracuse, N. Y. 732,797

Item	Quan.	Unit Prices (1)	(2)	(3)*
1. Clearing and grubbing	L. S.	$2,750.00	$2,500.00	$2,500.00
2. Unclassified excavation	328,500 c. y.	.26	.35	.35
3. Trench, culv. and brdg. excav.	16,025 c. y.	1.00	1.10	1.10
4. Overhaul	200,000 c. y.	.005	.005	.005
5. Trimming shoulders	44,000 l. f.	.20	.20	.20
6. Prepare fine grade	119,000 s. y.	.20	.20	.20
7. 12-in. vitr. sewer pipe	50 l. f.	.75	.75	.75
8. 4-in. pipe underdrain	825 l. f.	.30	.30	.30
9. 6-in. pipe underdrain	14,000 l. f.	.35	.35	.35
10. 18-in. corr. metal pipe	180 l. f.	2.97	2.70	2.70
11. 24-in. corr. metal pipe	74 l. f.	4.25	3.95	3.95
12. 30-in. corr. metal pipe	180 l. f.	5.72	5.20	5.20
13. 12-in. corr. metal pipe	250 l. f.	2.20	2.00	2.00
14. 18-in. c.i. or spec. rein. conc. pipe	920 l. f.	3.00	3.00	3.00
15. 24-in. c.i. or spec. rein. conc. pipe	750 l. f.	4.50	5.00	5.00
16. 27-in. c.i. or spec. rein. conc. pipe	200 l. f.	6.00	6.50	6.50
17. 30-in. c.i. or spec. rein. conc. pipe	350 l. f.	7.25	8.00	8.00
18. 36-in. c.i. or spec. rein. conc. pipe	802 l. f.	10.65	11.00	11.00
19. 42-in. c.i. or spec. rein. conc. pipe	400 l. f.	14.00	16.50	16.50
20. 48-in. c.i. or spec. rein. conc. pipe	420 l. f.	17.00	20.00	20.00
21. 54-in. c.i. or spec. rein. conc. pipe	140 l. f.	22.00	24.00	24.00
22. 60-in. c.i. or spec. rein. conc. pipe	72 l. f.	25.75	27.50	27.50
23. Portland cement	41,257 bbl.	2.25	2.30	2.30
24. Natural cement	5,663 bbl.	2.65	2.70	2.70
25. Conc. for structures (1:2:3½)	1,252 c. y.	18.00	20.00	20.00
26. Conc. in sidewalk and curb	140 c. y.	20.00	20.00	20.00
27. First class conc. (1:2:4)	3,310 c. y.	22.00	20.00	20.00
28. Second class concrete (1:2½:5)	45 c. y.	15.00	20.00	20.00
29. Loose stone backing, bagged screen gravel	663 c. y.	4.00	4.00	4.00
30. Metal reinf. for conc. pavmt. per sq. yd. of pavement	108,960 s. y.	.30	.30	.30
31. Steel fabric reinforcing	1,750 s. y.	.30	.30	.30
32. Reinforcing bars, structures	197,800 lb.	.07	.08	.08
33. Structural steel	631,000 lb.	.0935	.085	.085
34. Misc. iron and steel	400 lb.	.15	.15	.15
35. Pile shoes	184 ea.	1.25	1.50	1.50
36. Guard railing	17,000 l. f.	1.15	1.35	1.35
37. Reset cable guide rail	750 l. f.	.50	.50	.50
38. Guide posts	1,050 ea.	2.70	2.50	2.50
39. Reset guide posts	750 ea.	1.25	1.25	1.25
40. Metal railing	158.5 l. f.	4.95	4.50	4.50
41. Foundation course, run of bank grav.	3,800 c. y.	1.15	1.50	1.50
42. Bottom crse., bitum. matl., penet. mac	1,500 ton	3.25	3.35	3.35
43. Cement conc. pavmt	22,822 c. y.	5.70	5.00	5.50
44. Bitum. macadam, mix method optional	925 ton	7.85	8.30	8.30
45. Treat with bitum. matl	2,100 gal.	.20	.20	.20
46. Bitum. matl. waterproofing	500 gal.	.55	.50	.50
47. Memb. waterproofing without prot. crse	1,785 s. y.	1.25	1.25	1.25
48. Bitum. matl. A, paving	10,000 gal.	.13	.13	.13
49. Maintain traffic at culverts	L. S.	1,750.00	1,600.00	1,600.00
50. Maintaining traffic	2,000 l. f.	.10	.10	.10
51. Protection of traffic	L. S.	1,100.00	1,000.00	1,000.00
52. Dry riprap	605 c. y.	4.00	4.00	4.00
53. Grouted riprap	340 c. y.	7.50	8.00	8.00
54. Dismantle and store exist. bridge superstructures	L. S.	200.00	200.00	200.00
55. Cofferdams, etc	L. S.	3,300.00	3,000.00	3,000.00
56. Permanent sheeting and bracing	30 M bm.	80.00	80.00	80.00
57. Untr. timber test piles	250 l. f.	1.25	1.25	1.25
58. Furn. equip. for driving piles	L. S.	600.00	600.00	600.00
59. Screened gravel, loose measure	3,650 c. y.	2.25	2.50	2.50
60. Concrete gutters	150 s. y.	2.50	2.50	2.50
61. Conc. rt.-of-way markers	275 ea.	3.25	4.00	4.00
62. Timber and lumber	3 M bm.	5.00	100.00	100.00
63. Relay old pipe	400 l. f.	.20	.20	.20
64. Run of bank gravel backfill	310 c. y.	1.50	2.00	2.00
65. Longitudinal joint supports	8,150 ea.	.60	.60	.60
66. Remove exist. concrete	1,100 c. f.	.25	.25	.25
67. Transverse expan. joint support	11,100 l. f. jt.	.55	.55	.55
68. Untreated timber piles	4,150 l.f.	.55	.70	.70

*Engineer's estimate.

HIGHWAY WIDENING, DELAWARE

OWNER: Delaware State Highway Department, Dover, Del.

PROJECT: Widening 3.289 miles of concrete highway from Blades to Concord, Del. Involves all necessary drainage structures, sidewalk, wood curbing, and patching of portion of existing concrete pavement.

CONDITIONS: Contractor to furnish all materials and complete work by December 1, 1941. Rail, highway and water transportation facilities available. Prevailing wages to be paid.

BIDS: Three bids were received June 4, 1941, ranging from the contract low of $60,113 to $67,871.

LIST OF BIDDERS:

1. Walter Roach & Sons, Georgetown, Del. (contract) $60,113
2. Old Line Constr. Co., Chestertown, Md. 62,690
3. Waller Paving Co., Salisbury, Md. 67,871

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	2.7 ac.	$300.00	$400.00	$400.00
2. Grubbing	2.7 ac.	300.00	300.00	500.00
3. Unclassified excavation	11,000 c. y.	.50	.60	.75
4. Excavation for structures	120 c. y.	2.00	1.60	2.50
5. Borrow	1,500 c. y.	.30	.60	.65
6. Broken stone base course	30 ton	3.50	4.00	4.25
7. Cement concrete pavement	3,325 c. y.	11.00	11.14	11.50
8. ¾-in. std. dowel transverse expan. joints	950 l. f.	.80	.85	.90
9. Transverse contraction joints	1,300 l. f.	.40	.45	.50
10. Cement concrete masonry	125 c. y.	31.00	37.00	35.00
11. Reinforcing steel	8,600 lb.	.06	.07	.075
12. 12-in. rein. conc. pipe	150 l. f.	1.25	1.00	1.50
13. 15-in. rein. conc. pipe	435 l. f.	1.50	1.15	1.75
14. 18-in. rein. conc. pipe	171 l. f.	2.20	1.65	2.00
15. 24-in. rein. conc. pipe	15 l. f.	3.50	3.00	3.00
16. 8-in. corr. metal pipe	530 l. f.	1.00	1.00	1.25
17. 15-in. corr. metal pipe	60 l. f.	1.25	1.50	1.75
18. Timber piles	950 l. f.	.80	.90	1.25
19. Wood shoulder curb	3,650 l. f.	.16	.15	.20
20. Cement concrete sidewalk	4,000 s. f.	.28	.33	.30
21. Catch basins and drop inlets	2 ea.	30.00	25.00	50.00
22. Castings	1,500 l. f.	.08	.10	.08
23. 1-in. wire rope guard fence	2,960 l. f.	.90	.75	.80
24. End post attachments	24 ea.	10.00	7.00	10.00
25. Remove exist. conc. pavement	800 s. y.	.50	.35	.50
26. Patch present conc. pavement	360 s. y.	5.00	5.00	6.00
27. Std. dowel trans. exp. joints, patches	300 l. f.	1.00	1.05	1.10

HIGHWAY WIDENING AND RESURFACING, INDIANA

OWNER: Indiana State Highway Commission, Indianapolis.

PROJECT: Concrete widening, surface treated bituminous retread pavement and resurfacing on stabilized material base, or concrete base, 6.390 miles E. Lincoln Ave., State Rd. 4. Runs from Rock Run Creek, Goshen, to State Highway 13, Elkhart, Elkhart County, Ind.

CONDITIONS: Contractor to furnish all materials and complete work by November 1, 1941. Rail and highway transportation facilities available. Wage rates minimums are: skilled labor, 75c. per hr.; semi-skilled, 60c.; and common, 55c.

BIDS: Bids were asked June 3, 1941 on the project, for either a stabilized material base or a concrete base. Only one bid was received on the stabilized material base, $152,219, and the contract was tentatively awarded to this bidder. Three bids were received for the concrete base construction, ranging from $166,611 to $175,180. Engineers estimate $164,233.

LIST OF BIDDERS:

1. Rieth-Riley Constr. Co., Goshen, Ind. (tentative award) (Stabilized material base) $152,219
2. Paul J. Messer Constr. Co., Chicago, Ill. (Concrete base) 166,611
3. Rieth-Riley Constr. Co., Goshen, Ind. (Concrete base) 168,903
4. Moellering Constr. Co., Fort Wayne, Ind. (Concrete base) 175,180

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Grade B special borrow	2,610 c. y.	$0.80	$0.50	$1.50
2. Spec. Cl. D conc., structures	66.8 c. y.	30.00	35.00	25.00
3. Cl. D concrete, structures	75.9 c. y.	30.00	30.00	24.00
4. Reinforcing steel, struct.	8,638 lb.	.06	.06	.05
5. Std. catch basins, type C-2 (hood)	3 ea.	100.00	125.00	135.00
6. Spec. 15-in. pipe catch basin	1 ea.	50.00	55.00	35.00
7. Std. 15-in. pipe catch basin	2 ea.	40.00	50.00	30.00
8. Final trimming and cleaning	6.39 mi.	400.00	400.00	400.00
9. Sodding (fertilized)	12,224 s. y.	.20	.20	.19
10. Seeding (fertilized)	31.5 ac.	15.00	15.00	15.00
11. Furn. seed and fertilizer	31.5 ac.	25.00	25.00	25.00
12. Riprap	20 s. y.	3.00	3.00	3.00
13. Paved side ditch	795 l. f.	.90	1.00	1.00
14. Concrete sidewalk	640 s. y.	2.50	3.00	1.80
15. Sidewalk removal	675 s. y.	.25	.50	.20
16. Concrete crosswalk, type B	35 s. y.	3.00	4.50	2.25
17. Crosswalk removal	6 s. y.	.50	3.00	.30
18. Pavement removal	586 s. y.	.50	.60	.35
19. Pavement surface removal	6,916 s. y.	.30	.40	.50
20. Flex. steel plate guard rail	916 l. f.	1.25	1.25	1.00
21. Guide posts, type A	61 ea.	2.00	1.50	1.75
22. Guide posts, type B	280 ea.	2.00	1.25	1.85
23. R.R. crossing signs, type A	2 ea.	40.00	50.00	70.00
24. Bench mark posts	2 ea.	10.00	15.00	20.00
25. Concrete header	16 l. f.	1.50	3.00	2.00
26. Aggregate for subsurface drains	20 c. y.	3.00	3.00	2.50
27. Manhole covers, adjust to grade	1 ea.	10.00	100.00	10.00
28. Vitrified clay pipe, 24-in.	54 l. f.	2.75	3.00	2.60
29. 12-in. corr. metal pipe	1,030 l. f.	1.10	1.25	1.15
30. 15-in. corr. metal pipe	230 l. f.	1.45	1.40	1.40
31. 18-in. corr. metal pipe	78 l. f.	1.80	2.00	1.75
32. 24-in. corr. metal pipe	10 l. f.	2.50	3.00	2.55
33. 30-in. RC, CI or CM pipe	80 l. f.	3.25	3.50	3.20
34. 36-in. RC, CI or CM pipe	54 l. f.	4.00	4.50	4.00
35. 12-in. pipe	12 l. f.	1.40	1.30	1.10
36. 15-in. pipe	444 l. f.	1.50	1.50	1.25
37. 18-in. pipe	166 l. f.	1.80	2.00	1.75
38. 6-in. sewer pipe	16 l. f.	1.00	1.00	.65
39. 8-in. sewer pipe	108 l. f.	1.20	1.20	.75
40. 12-in. sewer pipe	2 l. f.	2.00	1.50	1.00
41. 15-in. VC or CC drain tile	30 l. f.	1.50	1.80	1.05
42. 24-in. bit. coat. CM or bit. coat. CM pipe with paved invert	60 l. f.	3.00	4.00	3.10
43. 54-in., as above	80 l. f.	9.00	12.00	12.50
44. Bit. coat. perf. CM, VC sewer, CC sewer, or perf.VC sew. pipe, subsurf. drains, 6-in.	100 l. f.	.90	1.20	.80
45. Perf. CM, VC sewer, CC sewer or perf. VC sewer pipe for subsurf. drains, 6-in.	70 l. f.	.90	1.20	.80
46. Perf. corr. met. pipe, subsurf. dr., 6-in.	30 l. f.	1.10	1.20	1.00
47. Compacted aggregate	150 ton	2.50	3.00	2.25
48. Concrete pavement	5,404 s. y.	2.40	2.30	1.95
49. Rein. steel, pavement	306 lb.	.10	.06	.05
50. Aggreg. for bit. surf. treat.	1,880 ton	2.45	3.00	2.50
51. Covering aggr., bit. surf. treatment	471 ton	2.50	3.00	2.50
52. Bitum. matl. for surf. and seal (FA, LA or T)	50,137 gal.	.10	.12	.10
53. Bitum. matl. for prime (LA or T)	12,534 gal.	.10	.12	.10
54. Aggregate, bitum. retread, Cl. A	9,150 ton	2.45	2.50	2.70
55. Cov. aggr. for bitum. retread	627 ton	2.50	2.50	2.50
56. Bit. matl. for bit. retread, 1st, 2nd and 3rd coats (EA, LA or T)	97,140 gal.	.10	.14	.10
57. Reconstructed concrete base	200 c. y.	15.00	25.00	15.00
58. Excavation, peat	2,806 c. y.	.30	.30	.25
59. Excavation, common	52,260 c. y.	.35*	.40*	.30*
60. Special borrow	862 c. y.	.50*	.50*	.40*
61. Overhaul, one balance	7,761 c. y.	.10*	.10	.07
62. Overhaul, two balances	2,711 c. y.	.15*	.20*	.12*
63. Bit. matl. for prime for bit. retread (LA or T)	6,268 gal.	.10*	.15*	.10*
64. Concrete base	32,775 s. y.	1.65*	1.65*	1.90*
65. Excavation, common	53,859 c. y.	.35†		
66. Excavation, special borrow	577 c. y.	.20†		
67. Overhaul, one balance	8,035 c. y.	.10†		
68. Overhaul, two balances	2,316 c. y.	.15†		
69. Bit. matl. for prime for bit. retread (LA or T)	21,945 gal.	.10†		
70. Finished mixture for stabil. matl. base	14,585 ton	2.50†		
71. Aggregate for shoulder drains	20 ton	2.50		
72. Bit. stab. mixt. (LA or T) for pub. road, priv. drive, and mailbox appr.	1,532 ton	4.00	No limit	4.50
73. Bit. stab. mixt. (LA or T) pub. road appr.	462 ton	4.00	No limit	3.50
74. Chem. stabil. mixt., priv. drive, etc.	1,070 ton	3.00	No limit	

* Bituminous retread on concrete base. † Bitum. retread on stabilized material base.

STREET PAVING, RICHMOND, KENTUCKY

OWNER: Kentucky Department of Highways, Frankfort, Ky. C. M. Wells, resident engineer.

PROJECT: Resurfacing and improving 0.937 miles of Main Street in Richmond, Ky. Width 33 to 59-ft. To be bituminous concrete surface and base, and waterbound macadam sub-base. Alternate bids were also asked on cement concrete (non-reinforced), and on bituminous concrete pavement. Class I.

CONDITIONS: Contractor to furnish all materials and complete work by August 25, 1942. Detours for traffic to be maintained. Rail and highway transportation facilities available. Wage rates prevailing in Madison County to be paid.

BIDS: Four contractors' bids were opened October 31, 1941, ranging from the contract low of $99,447 to $128,316.

LIST OF BIDDERS:

1. O. V. Arnett, Berea, Ky. (contract) $99,447
   (bit. conc. pavmt.—waterbound macadam sub-base)
   O. V. Arnett, Berea, Ky. (cement concrete pavement) 105,236
2. Fuller-Davies Co., Frankfort, Ky. (cement conc. pavmt.) 107,899
3. Kentucky-Virginia Stone Co., Middlesboro, Ky. (cement conc. pavmt.) 115,780
4. Carey Constr. Co., Lexington, Ky. (cem. conc. pavmt.) 123,950
   Carey Constr. Co., Lexington, Ky. (bit. conc. pavmt. Cl. I) 128,316

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove trees and stumps	11 ea.	$20.00	$15.00	$12.00
2. Roadway excavation	1,500 c. y.	1.00	.60	.80
3. Unclass. structure excav	1,600 c. y.	2.00	3.25	3.50
4. Remove conc. curb and gutter	9,410 l. f.	.10	.15	.20
5. Remove concrete curb	320 l. f.	.10	.20	.15
6. Remove concrete sidewalk	3,900 s. y.	.20	.20	.20
7. Remove brick sidewalk	430 s. y.	.25	.25	.20
8. Remove conc. entrance pavmt	1,015 s. y.	.25	.40	.50
9. Remove brick entrance pavmt	8 s. y.	1.00	.70	.50
10. Remove stone masonry	90 c. y.	1.00	2.00	2.70
11. Remove concrete masonry	2 c. y.	5.00	10.00	10.00
12. Remove catch basins	14 ea.	5.00	10.00	8.00
13. Remove pipe	831 l. f.	.20	.50	1.25
14. Remove, reset conc. and stone monument	1 ea.	100.00	300.00	175.00
15. Remove and reset hedge	360 l. f.	.20	.50	.75
16. Remove and relay sod	2,900 s. y.	.40	.25	.25
17. Remove and reset iron fence	106 l. f.	.40	.80	1.50
18. Remove conc. base and asph. surf.	21,000 s. y.	.15	.20	.25
19. Remove stone curb	37 l. f.	.30	.20	.20
20. Remove concrete pavement	123 s. y.	.20	.60	.50
21. Class A concrete steps	10.5 c. y.	40.00	35.00	30.00
22. Culvert masonry	90 c. y.	12.00	15.00	3.00
23. 4-in. concrete sidewalk	4,000 s. y.	2.00	1.60	1.90
24. 6-in. conc. entrance pavement	455 s. y.	2.50	2.00	3.00
25. Adjusting manholes	28 ea.	50.00	10.00	15.00
26. Manholes	8 ea.	100.00	95.00	125.00
27. Curb and butter box inlets, type 2	21 ea.	150.00	100.00	100.00
28. Conc. header curb (6x18-in.)	365 l. f.	1.00	.50	1.00
29. Project monuments	4 ea.	12.50	15.00	15.00
30. Bit. coated aggregate, class F	50 ton	6.00	6.00	7.00
31. Water	150 hund. gal.	.20	.25	.30
32. Utilities service	L. S.	1,000.00	8,500.00	2,500.00
33. 6-in. sewer pipe	100 l. f.	1.00	1.00	1.00
34. Pavement cross-overs	3 ea.	200.00	100.00	100.00
35. 12-in. rein. conc. culv. pipe	3 l. f.	1.25	1.50	1.50
36. 15-in. rein. conc. culv. pipe	483 l. f.	1.25	1.60	1.60
37. 18-in. rein. conc. culv. pipe	1,787 l. f.	1.60	2.00	2.00
38. 24-in. rein. conc. culv. pipe	463 l. f.	2.25	3.00	3.00
Types of Surfacing—Cement Concrete Pavement (non-reinforced)				
39. Cement concrete pavement	26,400 s. y.	2.50	2.35	2.70
40. Integral curb	9,490 l. f.	.40	.28	.30
41. Permanent traffic stripe	5,600 l. f.	.10	.08	.15
Bituminous Concrete, Class I—Waterbound Macadam Sub-base				
42. Cr. limestone (sub-base)	10,990 ton	2.25	....	....
43. Bituminous concrete base	4,250 ton	5.00	....	....
44. Bituminous concrete surface	1,820 ton	5.00	....	....
45. Curb and gutter	9,490 l. f.	1.00	....	....

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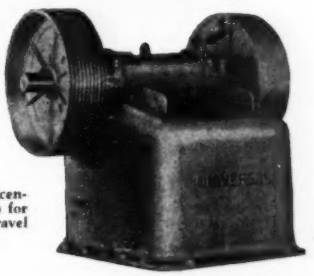

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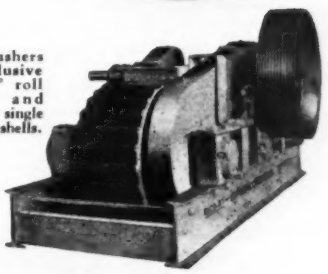

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CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS

BRICK STREET, DETROIT, MICHIGAN

OWNER: Michigan State Highway Dept., Lansing; Jack McCarthy, district engr.

PROJECT: Construction of 0.542 mi. of vitrified paving brick surfacing on concrete base on U. S. 112, Michigan Ave., from 29th St. to West Boulevard in Detroit, Mich. Includes all necessary grading and drainage structures, and removal of existing pavement, sidewalks, railway track and masonry and concrete structures.

CONDITIONS: Contractor to furnish all materials and complete work by July 1, 1941. Highway transportation facilities available. There is possibility of being held up on account of care which must be taken to protect existing public utilities. Wage rates specified are: skilled labor, $1.50 to $1.62½ per hr.; semi-skilled, 90 to 92½c. per hr.; and the common labor rate, 80c. per hr.

BIDS: Three bids were opened February 11, 1941, ranging from the contract low of $73,777 to $82,333.

LIST OF BIDDERS.

1. Julius Porath, Detroit, Mich. (contract) $73,777
2. Thomas E. Currie Co., Detroit, Mich 80,041
3. Cooke Contracting Co., Detroit, Mich 82,333

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old pavement	2,093 s. y.	$0.40	$0.35	$0.40
2. Remove sidewalk	974 s. y.	.15	.30	.25
3. Remove masonry and conc	120 c. y.	3.50	5.00	5.00
4. Remove railway track	1,296 l. f.	.70	1.00	1.00
5. Earth excavation	1,607 c. y.	.65	1.00	.75
6. Sand, gravel fill (loose meas.)	1,958 c. y.	.70	.75	.75
7. Grade A concrete	13.7 c. y.	17.00	40.00	20.00
8. Steel reinforcement	2,827 lb.	.06	.10	.06
9. 12-in. sewer	328 l. f.	1.50	2.50	2.00
10. Manholes, type 1-A	2 ea.	100.00	100.00	100.00
11. Catch basins, type 3-B	4 ea.	80.00	90.00	100.00
12. Catch basin traps	4 ea.	25.00	25.00	25.00
13. Conc. base crse., 10–14–10-in.	12,013.06 s. y.	1.80	1.90	2.00
14. Conc. base crse., 10-in. uniform	350.7 s. y.	1.75	2.50	2.00
15. Conc. pavement, 9-in. uniform	117 s. y.	1.70	2.00	1.95
16. Conc. pavement, 7-in., unifrom	60.6 s. y.	1.65	1.90	1.90
17. Pavement reinforcement	12,364.3 s. y.	.18	.20	.22
18. Vitrified brick surf. course	12,587.5 s. y.	2.60	2.65	2.77
19. Sheet asph. wearing course	26.96 ton	10.00	15.00	12.00
20. Asphaltic binder	19.73 ton	8.00	10.00	10.00
21. Conc. curb (det. 1)	45 l. f.	1.00	1.00	1.00
22. Conc. curb (det. 2)	448 l. f.	1.00	1.00	1.00
23. Conc. curb (det. 2A)	66 l. f.	1.00	1.25	1.00
24. Conc. curb (det. 3)	2,437 l. f.	1.15	1.25	1.25
25. Conc. curb (det. 3A)	35 l. f.	1.10	1.35	1.25
26. Conc. curb (det. A)	43 l. f.	3.50	2.00	3.00
27. Conc. driveway return (det. 15)	90 l. f.	1.25	2.00	1.50
28. Conc. driveway return (det. 18)	138 l. f.	1.25	2.00	1.50
29. Concrete end header (det. 20)	43 l. f.	1.00	.50	1.00
30. 4-in. concrete sidewalk	1,134 s. f.	.16	.18	.20
31. 6-in. concrete sidewalk	26,666 s. f.	1.65	.20	.23
32. 7-in. concrete sidewalk	1,085 s. f.	.19	.30	.25
33. Ornamental hand rail	198 l. f.	2.50	3.00	3.00
34. Ornamental iron fence	42.5 l. f.	8.00	8.00	5.00
35. 18-in. concrete gutter	66 l. f.	1.25	2.00	1.00
36. Seal lamp post bases	18 ea.	2.00	5.00	2.00

CONCRETE PAVEMENT, KANSAS

OWNER: State Highway Commission of Kansas, Osawatomie, Kan.; R. B. Wills, State Highway Engineer.

PROJECT: Construction of 0.283 miles of concrete pavement in Osawatomie, Kan. (Part I) and 2.594 miles of concrete pavement north from Osawatomie, Miami County, Kan. (Part II).

CONDITIONS: Contractor to furnish all materials and complete work in 85 working days. Rail and highway transportation facilities available. Minimum wage rates are: skilled labor, 65c. per hr.; semi-skilled, 50c.; and common, 40c.

BIDS: Five bids were received on Part I August 27, 1941, ranging from the contract low of $28,217 to $33,861. Five bids also received on the same date for Part II. They range from $84,825 to $94,728.

Part I—In Osawatomie, Kan.

LIST OF BIDDERS:

1. C. J. McCoy, Emporia, Kan. (contract) $28,217
2. Geiger & Rutherford, Leavenworth, Kan 29,167
3. Stannard Constr. Co., Wichita, Kan 29,730
4. Harrison Engr. & Constr. Corp., Kansas City, Mo 30,839
5. Western Contracting Corp., Sioux City, Iowa 33,861

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Common excavation	650 c. y.	$0.40	$0.50	$0.30
2. Conc. pavement, 6-in. uniform	54.7 s. y.	2.15	1.75	2.20
3. Conc. pavement, 7-in. uniform	5,325.2 s. y.	2.25	2.35	2.36
4. Conc. pavement, 9-in. uniform	31.8 s. y.	4.00	2.65	4.50
5. Conc. pavement, 9–7–9-in	2,795.3 s. y.	2.25	2.35	2.36
6. Remove, relay bit. filled brick pavmt	200 s. y.	3.00	1.00	2.00
7. 12-in. storm sewers	126 l. f.	2.00	1.30	2.00
8. 15-in. storm sewers	192 l. f.	2.50	2.10	2.50
9. 24-in. storm sewers	1,442 l. f.	3.00	3.40	3.75
10. Comb. curb and gutter, type I	1,413.4 l. f.	1.00	1.00	.90
11. Comb. curb and gutter, type II	211.4 l. f.	1.25	1.10	1.00
12. Reinforced concrete manholes	4 ea.	100.00	75.00	90.00
13. Inlets, type A-5	4 ea.	75.00	125.00	100.00
14. Inlets, type A-7. 5	2 ea.	90.00	175.00	150.00
15. Steel plate guard fence	150 l. f.	1.00	1.05	1.00
16. Sidewalk construction, 4-in	500 s. y.	2.00	1.60	1.75
17. Sidewalk construction, 6-in	35.8 s. y.	2.10	2.20	2.00
18. Surfacing material	24 c. y.	.....	3.20	2.00

Part II—North of Osawatomie, Kan.

LIST OF BIDDERS:

1. C. J. McCoy, Emporia, Kan. (contract) $84,825
2. Geiger & Rutherford, Leavenworth, Kan 85,621
3. Harrison Engr. & Constr. Corp., Kansas City, Mo 86,774
4. Stannard Constr. Co., Wichita, Kan 87,790
5. Western Contracting Corp., Sioux City, Iowa 94,728

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Common excavation	9,550 c. y.	$0.40	$0.50	$0.20
2. Concrete pavement, 9-in. uniform	219.7 s. y.	4.00	2.65	4.00
3. Conc. pavement, 9–7–9-in	34,679.9 s. y.	2.25	2.25	2.35
4. Steel plate guard fence	1,650 l. f.	1.00	1.05	1.10
5. Wood guide posts	61 ea.	1.00	2.00	2.00
6. Surfacing material	50 c. y.	2.50	3.20	3.00
7. Reflectorized advance warning signs	2 ea.	30.00	25.00	50.00
8. Reflectorized R. R. crossing signs	2 ea.	100.00	85.00	150.00

HIGHWAY IMPROVEMENTS NEVADA

OWNER: Nevada Department of Highways, Carson City. R. A. Allen, state highway engineer.

PROJECT: Grading, drainage structures, and gravel surfacing 4.46 miles of Route 60, Section A, between Nelson and point 4½ miles west of Nelson, in Clark County, Nev.

CONDITIONS: Contractor to furnish all materials. Railway transportation facilities available to Las Vegas, and highway to site of work. Wage rates specified as minimums are: skilled labor, $1.375 per hr.; semi-skilled, 75c. to $1.375; and common labor, 70c.

BIDS: Six bids were received November 13, 1941, ranging from the contract low of $87,571 to $108,436.

LIST OF BIDDERS:

1. Silver State Constr. Co., Fallon, Nev. (contract) $87,571
2. Gibbons & Reed, Salt Lake City, Utah 90,952
3. Dodge Constr. Co., Fallon, Nev 94,643
4. Hoope Constr. Co., Twin Falls, Mont 104,161
5. A. Teichert & Sons, Inc., Sacramento, Calif 106,443
6. Isbell Constr. Co., Reno, Nev 108,436

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Signs	L.S.	$200.00	$100.00	$250.00
2. Roadway excavation	94,300 c. y.	.52	.52	.60
3. Drainage excavation	1,839 c. y.	.75	.70	.60
4. "V" type ditches	58 sta.	5.00	5.00	7.50
5. Overhaul	189,212 sta. y.	.01	.01	.015
6. Overhaul	2,306 y. mi.	.10	.15	.15
7. Structure excavation	1,014 c. y.	1.50	1.00	1.50
8. Backfill	1,489 c. y.	.75	1.00	.50
9. Subgrade, type "C"	4.46 mi.	100.00	150.00	100.00
10. Water	23 M gal.	5.00	5.00	5.00
11. Gravel surface	29,561 ton	.37	.46	.40
12. Class "D" concrete	1 c. y.	50.00	40.00	45.00
13. Mortar rubble masonry	121 c. y.	20.00	15.00	20.00
14. 18-in. corr. metal pipe, dipped	248 l. f.	2.50	1.95	2.50
15. 24-in. corr. metal pipe, dipped	404 l. f.	3.50	2.90	3.25
16. 30-in. corr. metal pipe, dipped	316 l. f.	5.00	3.70	3.75
17. 36-in. corr. metal pipe, dipped	302 l. f.	6.00	5.90	5.50
18. 30x17-in. corr. met. arch pipe, dipped	116 l. f.	4.00	4.50	4.00
19. 37x21-in. corr. met. arch pipe, dipped	62 l. f.	5.00	5.26	4.75
20. Hand-laid riprap	83 c. y.	10.00	8.00	5.00
21. Grouted hand-laid riprap	208 c. y.	10.00	12.00	7.50
22. Monuments	18 ea.	4.00	4.00	3.50
23. Special signs	L.S.	200.00	150.00	100.00
24. 6x4-ft. laminated culvert	43 l. f.	25.00	25.00	25.00
25. Double 6x4-ft. laminated culvert	119 l. f.	45.00	60.00	45.00
26. 75-in. sectional plate pipe	85 l. f.	25.00	26.00	22.00

"TO PROVIDE FOR THE COMMON DEFENSE, TO PROMOTE THE GENERAL WELFARE"

Bad medicine for big bombers

ONE WAY to spoil a bomber's aim is to hang a curtain of steel over your ship and dare him to come down through it. To get that curtain of steel up there requires quick-firing, flexible guns.

To the plant of the Westinghouse Electric Elevator Company the Navy, a few months ago, brought its plans for such a gun. And to Westinghouse was given the important job of building the mounts that would control the aiming of these batteries of quick-firing guns.

And the Navy said, "Well done!"

Today, over the Westinghouse plant, there floats the Navy's "E" pennant—for excellence—eloquent testimony to the manner in which this Westinghouse plant performed the job. How was this plant able to get into growing production of these mounts so quickly? The answer lies in a Westinghouse characteristic called "know how"—the ability to get things done in the best possible way.

This Westinghouse "know how" makes itself felt wherever Westinghouse craftsmen build things. Whether for the common defense or the general welfare, this "know how" is doing a job. The same skill and ingenuity that made so many splendid things for peacetime living are now being applied to many important war weapons.

"Know how" will work for you again

We look forward to the day when Westinghouse "know how" will again supply you with electrical equipment to help you build for peace. To speed that day means just one thing to us: to produce, in ever-increasing quantities, the tools with which to get the victory job done.

Westinghouse

For the Common Defense

Sterilamps
Bomb Fuses
Tank Equipment
Military Radio Equipment
Plastic Plane Parts
Naval Ordnance
Navy Ship Turbines and Gears
Blackout Plant Lighting Equipment

For the General Welfare

Air Conditioning
Lighting
Panel Boards
No-Fuze Load Centers
Lamps
Elevators

These lists mention only some of the many thousands of Westinghouse products.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, PITTSBURGH, PENNA.

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HIGHWAY SURFACING, MONTANA

OWNER: State Highway Commission of Montana, Helena; Ray Kuhns, division engineer, Great Falls, Mont.

PROJECT: Grading and surfacing 7.718 miles of Rogers Pass-Simms Road, Section C, in Lewis and Clark County, Mont. Includes all excavation, culverts and pipe required.

CONDITIONS: Contractor to furnish all materials and complete work by July 31, 1942. Rail and highway transportation facilities available. Minimum wage rates specified are: skilled labor, $1.20 per hr.; semi-skilled, 82½c.; and common, 65c. There is a possibility of shortage of skilled workmen on project.

BIDS: Nine bids were received July 22, 1941 ranging from the contract low of $76,161 to $109,672.

LIST OF BIDDERS:

1. Thomas Staunton, Great Falls, Mont. (contract) $76,161
2. Stanley H. Arkwright, Great Falls, Mont. 80,622
3. Union Constr. Co., Great Falls, Mont. 81,875
4. J. L. McLaughlin, Great Falls, Mont. 88,154
5. Peter Kiewit Sons' Co., Omaha, Nebr. 88,385
6. Nilson-Smith Constr. Co., Great Falls, Mont. 89,124
7. S. Birch & Sons Constr. Co., Great Falls, Mont 91,874
8. S. J. Groves & Sons Co., Billings, Mont. 104,240
9. E. O. Howe, Great Falls, Mont. 109,672

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Unclassified excavation	263,735 c.y.	$0.13	$0.154	$0.155
2. Culvert excavation	891 c.y.	1.00	.80	1.00
3. Overhaul	608,000 st.y.	.01	.008	.01
4. Base crse. on gravel surf.	40,786 ton	.45	.48	.45
5. Binder	2,600 c.y.	.01	.01	.01
6. Overhaul on binder	4,000 y. mi.	.01	.01	.01
7. Watering	2,000 M gal.	2.00	1.00	1.20
8. Rolling	350 hr.	3.50	4.00	4.00
9. 15-in. rein. conc. pipe culv.	192 l.f.	1.70	1.65	1.80
10. 24-in. rein. conc. pipe culv.	1,168 l.f.	3.20	3.00	3.00
11. 30-in. rein. conc. pipe culv.	304 l.f.	4.70	5.00	5.00
12. 36-in. rein. conc. pipe culv.	216 l.f.	6.25	6.00	6.00
13. 48-in. rein. conc. pipe culv.	220 l.f.	10.00	11.00	11.00
14. 24-in. corr. met. syphon pipe	276 l.f.	3.10	3.25	4.00
15. 36-in. corr. met. syphon pipe	76 l.f.	6.00	6.00	7.00
16. Class B concrete	1.53 c.y.	30.00	50.00	50.00
17. Class A concrete	2.63 c.y.	40.00	50.00	40.00
18. Reinforcing steel	211 lb.	.10	.10	.15
19. Grouted riprap	150 s.y.	3.50	3.00	4.00
20. Conc. project markers	2 ea.	10.00	25.00	10.00
21. Wood station markers	41 ea.	2.00	3.00	3.00
22. Conc. rt.-of-way monuments	41 ea.	2.50	3.00	3.00

HIGHWAY, NORTH CAROLINA

OWNER: North Carolina State Highway and Public Works Commission, Raleigh.

PROJECT: Concrete paving, fine grade on U. S. Routes 17 and 264 between intersection of the above routes and North Carolina Route 33 and Pamlico River. Approximately 2.75 miles in length. Roadway 18-ft. and 22-ft. Widening of portion of roadway also included in letting.

CONDITIONS: Contractor to furnish all materials and complete roadway in 60 days. Highway transportation facilities available. Wage rates specified are: skilled labor, 55c. per hr.; semi-skilled, 35c.; and common, 30c.

BIDS: Three bids were opened July 29, 1941, ranging from the low of $85,128 to $92,935.

LIST OF BIDDERS:

1. J. S. Hill Corp., Washington, N. C. $85,128
2. Ballenger Paving Co., Greenville, S C. 89,658
3. Cobb & Homewood, Inc., Chapel Hill, N. C. 92,935

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Unclassified excavation	6,400 c. y.	$0.47	$0.50	$0.45
2. Borrow excavation	5,000 c. y.	.47	.50	.45
3. One-half mile overhaul	1,000 c. y.	.05	.06	.05
4. Traffic bound macadam base cr se	750 ton	3.60	4.00	3.90
5. Conc. pavmt. (9-7-7-7-9-in.) 22-ft.	20,040 s. y.	2.37	2.45	2.60
6. Conc. pavmt. (9-7-7-9-9-7-7-9-in.) 18-ft.	230 s. y.	2.80	3.00	4.00
7. Conc. pavement (8-in. unif.) widen	1,420 s. y.	2.55	2.65	2.70
8. Rein. conc. pavmt. (9-7-7-7-9-in.) 22-ft.	5,570 s. y.	2.55	2.70	2.85
9. Class C conc. (headwalls)	3 c. y.	25.00	30.00	30.00
10. 18-in. rein. conc. pipe extension	20 l. f.	2.50	3.00	3.00
11. 24-in. rein. conc. pipe extension	8 l. f.	4.00	4.00	4.00
12. Stone shoulder drains	60 c. y.	4.50	5.00	5.00
13. Raised edge curb (3x9-in.)	6,740 l. f.	.20	.25	.20
14. Wire cable guard rail	7,856 l. f.	1.07	1.15	1.15
15. Conc. surface drains	13 ea.	20.00	30.00	35.00
16. Galv. metal funnels (type 2)	13 ea.	25.00	30.00	32.50
17. 10-in. corr. metal pipe	268 l. f.	1.00	1.10	1.20
18. Barbed wire fence reset	100 l. f.	.02	.025	.025
19. Hogwire fence reset	100 l. f.	.02	.035	.025
20. Comb. barb and Hogwire fence reset	100 l. f.	.02	.05	.035
21. Other fence reset	100 l. f.	.02	.03	.03
22. Right-of-way markers	9 ea.	2.50	3.00	2.75

HIGHWAY RELOCATION WASHINGTON

OWNER: U. S. Bureau of Reclamation, Coulee Dam, Wash.

PROJECT: Earthwork, structures and surfacing in connection with relocation of Stevens and Ferry County roads serving Kelly Hill, Kettle River, and Napoleon Bridge, Columbia River Reservoir, Columbia Basin project. Work located near Boyds, Wash. Involves removing and re-erecting structural steel spans of Napoleon Bridge; earth and rock excavation, culverts, backfill and necessary fencing.

CONDITIONS: Contractor to furnish all sand and gravel, backfill materials, surfacing materials, rock and rock spalls for riprap, form material, lumber for strutting corrugated metal pipe culverts, nails, wire and wire ties, temporary supports, water, rivets, and all other materials not part of completed structures. Government to furnish balance of materials. Work to be completed in 180 calendar days. Rail and highway transportation facilities available at Boyds, Wash. Wage rates are: skilled labor, $1.37½ to $1.65 per hr.; semi-skilled, 85c. to $1.10; and common, 75 to 80c.

BIDS: Four bids were opened October 21, 1941, ranging from the low of $112,510 to $152,911. (Total for Schedules 1 and 2.)

LIST OF BIDDERS: (Schedules 1 and 2 combined).

1. Roy L. Bair, Spokane, Wash. $112,510
2. L. A. Woodward Co., Missoula, Mont. 117,853
3. Erickson Paving Co., Seattle, Wash. 133,131
4. Colonial Constr. Co., Spokane, Wash. 152,911

Schedule 1

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing right-of-way	27 ac.	$60.00	$150.00	$75.00
2. Grubbing right-of-way	21 ac.	60.00	70.00	75.00
3. Excavation, common, for roadway	91,500 c. y.	.20	.18	.25
4. Excavation, rock, for roadway	7,100 c. y.	.90	.80	1.10
5. Overhaul	21,000 sta. c. y.	.01	.02	.02
6. Excav., common; drainage channels and dikes	135 c. y.	1.00	1.00	1.00
7. Riprap	2,630 c. y.	1.20	1.25	1.50
8. Road surfacing	3,400 c. y.	.75	.50	.60
9. Excav., common; structures	320 c. y.	4.00	1.50	3.00
10. Excavation, rock; structures	30 c. y.	4.00	5.00	10.00
11. Backfill	145 c. y.	.75	.50	.50
12. Compacting backfill	100 c. y.	.75	.50	.50
13. Rock fill about bridge pier	970 c. y.	1.30	2.00	2.00
14. Conc. in br. piers and abutments	311 c. y.	28.00	28.00	32.00
15. Place reinforcing bars	27,000 lb.	.035	.05	.05
16. Lay 18-in. corr. metal pipe	1,244 l. f.	.40	.70	.60
17. Lay 24-in. corr. metal pipe	26 l. f.	.40	.80	1.00
18. 18-in. half-round corr. metal spillways	108 l. f.	1.00	.80	1.25
19. Drive steel sheet piling	1,680 l. f.	1.50	1.25	2.00
20. Driving timber piles	584 l. f.	1.00	.65	1.50
21. Erect timber in bridge	41 M bm.	35.00	40.00	38.00
22. Remove and re-erect str. steel spans of Napoleon Bridge	L. S.	3,500.00	9,000.00	5,800.00
23. Remove piers and timber appr. of existing Napoleon Bridge	L. S.	300.00	500.00	900.00
24. Constr. right-of-way fences	3 mi.	300.00	220.00	200.00
25. Constr. right-of-way fence gates	4 ea.	35.00	25.00	25.00

Schedule 2

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing right-of-way	43 ac.	$60.00	$150.00	$75.00
2. Grubbing right-of-way	27 ac.	60.00	70.00	75.00
3. Excavation, common; roadway	58,900 c. y.	.20	.20	.27
4. Excavation, rock; roadway	40,000 c. y.	.95	.80	.98
5. Overhaul	14,300 sta. c. y.	.01	.05	.02
6. Excav., common; drain. channels and dikes	115 c. y.	.90	1.00	1.00
7. Excavation, common; structures	350 c. y.	1.10	1.50	1.00
8. Backfill	250 c. y.	.90	1.00	.50
9. Compacting backfill	200 c. y.	.80	1.00	.50
10. Lay 18-in. corr. metal pipe	1,986 l. f.	.40	1.00	.80
11. Lay 48-in. corr. metal pipe	120 l. f.	.75	2.00	2.00
12. Constr. 18-in. half-round corr. metal spillways	20 l. f.	1.00	1.00	2.00
13. Constr. right-of-way fences	1.3 mi.	300.00	220.00	225.00
14. Constr. right-of-way fence gates	3 ea.	35.00	25.00	30.00

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Face to face with the toughest job we ever had, the need for PROVED power is urgent. There is no time for experimenting . . . that's why Cummins was among the first called upon for an "all-out" production for defense. Cummins Engine Company, Columbus, Indiana.

HIGHWAYS, MASSACHUSETTS

OWNER: Commonwealth of Massachusetts, Dept. of Public Works, Boston; M. J. Dalton, Worcester, engr.

PROJECT: Construction of bituminous macadam highway and two reinforced concrete bridges along new location of Providence Road, Sutton, Worcester County, Mass.

CONDITIONS: Contractor to furnish all materials and complete work by July 3, 1942. Bids were asked on penolithic or bituminous surfacing; contract awarded on basis of latter. Highway transportation available, and rail facilities available within reasonable haul. Road to be constructed is on new location. No traffic to be provided for except at cross-roads. Minimum wage rates specified are: skilled labor, $1.00 per hr.; semi-skilled, 65c.; and common, 62½c.

BIDS: Eight bids were opened May 6, 1941, ranging from the contract low of $481,354 to $709,942.

LIST OF BIDDERS:

1. C. & R. Constr. Co., Roslindale, Mass. (contract)...$481,354
2. Carlo Bianchi Co., Inc., Framingham, Mass..... 499,696
3. P. Salvucci, Waltham, Mass..... 507,049
4. Bronx Waterworks Corp., Bronx, N. Y..... 516,282
5. V. Barletta Co., Roslindale, Mass..... 525,057
6. Lane Constr. Corp., Meriden, Conn..... 540,489
7. M. De Matteo Constr. Corp., Roslindale, Mass..... 613,228
8. G. Bonazolli & Son, Hudson, Mass..... 709,942

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear and grub	42 ac.	$50.00	$150.00	$100.00
2. Roadway earth excavation	62,000 c. y.	.79	.35	.35
3. Class A rock excavation	65,000 c. y.	.79	1.25	1.25
4. Peat, remove and stack	31,000 c. y.	.20	.30	.35
5. Bridge excavation	1,200 c. y.	1.00	3.00	2.00
6. Trench excavation	9,300 c. y.	1.00	1.00	1.00
7. Channel excavation	800 c. y.	1.00	1.00	1.00
8. Class B rock excavation	2,700 c. y.	3.00	4.00	2.00
9. Trees removed	16 ea.	10.00	10.00	10.00
10. Ordinary borrow	1,253,000 c. y.	.30	.30	.35
11. Gravel borrow	73,450 c. y.	.45	.40	.50
12. Sand borrow	2,500 c. y.	1.00	1.00	1.00
13. Strip gravel pits	7,365 c. y.	.10	.15	.20
14. Fine grading, rolling and finish	1,222,000 s. y.	.03	.03	.03
15. Crushed stone for base course	14,900 ton	2.38	2.40	2.50
16. Gravel for surfacing	200 c. y.	1.50	1.00	1.00
17. Bituminous surface treatment	450 gal.	.10	.20	.10
18. Cl. 1 bitum. conc. pavement	377 ton	6.50	8.00	7.00
19. Cl. A cement concrete masonry	2,255 c. y.	21.00	17.50	17.00
20. Class B cem. concrete masonry	513 c. y.	14.00	17.00	17.00
21. Class C cem. concrete masonry	225 c. y.	18.00	18.00	17.00
22. Class D cem. concrete masonry	55 c. y.	60.00	65.00	17.00
23. Steel reinforcement, structures	280,250 lb.	.045	.045	.05
24. Membrane waterproofing	1,115 s. y.	2.00	2.00	2.00
25. Bituminous damp-proofing	1,040 s. y.	.30	.35	.25
26. Field stone masonry dry	105 c. y.	8.00	10.00	10.00
27. Metal bridge railings, type A	185 l. f.	15.50	12.00	15.00
28. Metal bridge railings, type B	102 l. f.	19.00	20.00	15.00
29. Balance stone walls; remove, rebuild	100 l. f.	.50	.60	1.00
30. Special curing for concrete	1,440 s. f.	.05	.07	.20
31. Catch basins	127 ea.	60.00	60.00	60.00
32. Manholes	18 ea.	60.00	60.00	60.00
33. Manhole frame and cover	1 ea.	25.00	25.00	30.00
34. 12-in. rein. concrete pipe	4,240 l. f.	1.10	1.25	1.20
35. 15-in. rein. concrete pipe	130 l. f.	1.45	1.50	2.00
36. 18-in. rein. concrete pipe	1,230 l. f.	1.85	2.25	2.00
37. 24-in. rein. concrete pipe	1,270 l. f.	2.85	3.50	3.00
38. 30-in. rein. concrete pipe	460 l. f.	4.00	5.50	4.00
39. 42-in. rein. concrete pipe	300 l. f.	7.50	7.00	8.00
40. 48-in. rein. concrete pipe	116 l. f.	8.70	8.50	10.00
41. 60-in. rein. concrete pipe	140 l. f.	15.50	15.00	15.00
42. Asph. coated corr. metal pipe, 12-in.	54 l. f.	1.30	1.50	2.00
43. Asph. coated corr. metal pipe, 18-in.	30 l. f.	1.85	2.25	2.00
44. 6-in. heavy weight cast iron pipe	400 l. f.	1.40	1.25	1.50
45. 12-in. cem. conc. pipe	2,470 l. f.	.60	.75	.80
46. 15-in. cem. conc. pipe	824 l. f.	.95	1.10	1.00
47. 18-in. cem. conc. pipe	360 l. f.	1.35	1.50	1.50
48. 8-in. subdrain	2,415 l. f.	2.00	2.50	1.00
49. 12-in. subdrain	284 l. f.	2.25	3.00	2.00
50. 15-in. subdrain	186 l. f.	2.50	3.50	2.00
51. 6-in. perforated metal pipe	160 l. f.	.65	2.25	1.00
52. Penolithic macadam paving (waterways)	50 s. y.	2.00	3.00	1.00
53. Stock fence	5,500 l. f.	.18	.20	.16
54. Stock fence gates	9 ea.	15.00	15.00	15.00
55. Highway guard, type M6C	1,350 l. f.	.87	.90	1.00
56. Highway guard, type M8C	9,200 l. f.	.96	1.00	1.00
57. Highway guard end anchors	49 ea.	30.00	40.00	35.00
58. Hwy. guard intermediate anchors	12 ea.	30.00	40.00	35.00
59. Hwy. guard bridge anchors	6 ea.	25.00	35.00	40.00
60. Individual posts	60 ea.	3.00	3.00	3.00
61. Barrier fence	216 l. f.	2.00	2.75	1.00
62. Granite curb, type VA4, str	150 l. f.	1.00	1.00	1.50
63. Granite curb, type VB, str	8,100 l. f.	.85	.80	1.00
64. Granite curb, type VB, curved	1,860 l. f.	1.10	1.00	1.50
65. Granite curb, type VA5, str	507 l. f.	1.15	1.20	1.00
66. Granite curb inlets	89 ea.	9.50	10.00	15.00
67. Granite curb inlets, curved	6 ea.	12.50	12.00	20.00
68. Granite curb corners, type A	24 ea.	5.00	5.00	6.00
69. Concrete edging, Type SFA, str	5,250 l. f.	.82	.75	1.00
70. Concrete edging, type SFA, curved	700 l. f.	1.10	1.25	1.00
71. Concrete edging transitions	8 ea.	8.00	9.00	3.00
72. Concrete transition curb inlets (str.)	14 ea.	12.00	14.00	20.00
73. Conc. trans. curb inlets (curved)	1 ea.	15.00	20.00	20.00
74. Remove and reset crub	200 l. f.	.50	.50	1.00
75. Granolithic walk	250 s. y.	2.00	2.00	2.00
76. Bit. conc. walk surface	43.5 ton	6.50	8.00	8.00
77. Traffic signal conduit, type BF	550 l. f.	.50	.60	1.00
78. Town line post, remove and reset	1 ea.	10.00	15.00	15.00
79. Bounds	84 ea.	4.00	5.00	5.00
80. Remove and reset bounds	2 ea.	5.00	5.00	5.00
81. Remove and stack bounds	5 ea.	5.00	5.00	2.00
82. Seeding	45,000 s. y.	.05	.06	.05
83. Peat rehandled and spread	10,800 c. y.	.25	.50	.35
84. Cr. stone for bitum. macadam surf.	10,600 ton	2.40	2.50	2.50
85. Bitum. for macadam surf	107,500 gal.	.09	.0975	.10
86. Bitum. for macadam surf. (seal)	62,000 gal.	.09	.0975	.10

HIGHWAY, TEXAS

OWNER: Texas State Highway Dept., Austin, Tex.; D. C. Greer, state highway engineer.

PROJECT: Grading, culverts, flexible base, and double asphalt surface treatment of Highway No. 158, Taylor County, Tex., from one mile southwest of View, Tex., approximately 16 miles in southwesterly direction.

CONDITIONS: Contractor to furnish all materials and complete work in 175 working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.00 per hr.; semi-skilled, 50c; and common, 40c.

BIDS: Three bids were opened February 19, 1942, ranging from the contract low of $360,898 to $437,248.

LIST OF BIDDERS:

1. Morgan Constr. Co., T. M. Brown & Son, and W. S. Crawford, Dallas, Tex. (contract).....$360,898
2. Thomas & Ratliff, Rogers, Tex..... 407,430
3. Cage Bros. & F. M. Reeves & Son, Bishop, Tex..... 437,248

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	34.9 ac.	$0.35	$100.00	$100.00
2. Unclassified road excavation	258,776 c.y.	.50	.75	.75
3. Common and special borrow	15,980 c.y.	.23	.50	.40
4. Unclassified channel excavation	3,623 c.y.	.30	1.00	1.00
5. Unclassified structural excav	1,118 c.y.	2.00	3.00	4.50
6. Blading embankment (blade grader)	605 hr.	3.50	5.00	4.00
7. Blading embankment (bulldozer)	491 hr.	3.00	3.50	5.00
8. Overhaul	20,959 ½-mi. yd.	.10	.10	.10
9. Overhaul (selected mat'l.)	311,127 ½-mi. yd	.03	.05	.05
10. Sprinkling	14,730 M gal.	1.00	1.00	1.00
11. Rolling	2,632 hr.	2.50	2.50	3.00
12. Rolling (spec.)	605 hr.	3.50	3.50	4.00
13. Flexible base	105,288 c.y.	1.00	.60	.60
14. Add'l. quarter-mile haul	940,865 c.y.	.02	.02	.03
15. Prime coat (MC-1)	64,600 gal.	.09	.09	.10
16. Asphalt (OA-230)	129,400 gal.	.09	.09	.10
17. Aggregate	4,135 c.y.	3.50	3.25	4.00
18. Class A concrete	207.68 c.y.	20.00	25.00	30.00
19. Cl. A concrete for ext. struct	465.41 c.y.	20.04	30.00	35.00
20. Mortar rubble masonry	262.9 c.y.	15.00	15.00	15.00
21. Reinforcing steel	91,444 lb.	.055	.07	.06
22. Relay culv. pipe, over 18-in	167.4 l. f.	1.00	3.00	2.00
23. Common mortar riprap	86 c.y.	8.00	6.00	10.00
24. 24-in. ext. str. rein. conc. pipe	164 l.f.	3.14	3.75	5.00
25. 30-in. ext. str. rein. conc. pipe	28 l.f.	3.96	4.50	5.50
26. 36-in. ext. str. rein. conc. pipe	90 l.f.	4.98	6.00	6.00
27. 42-in. ext. str. rein. conc. pipe	116 l.f.	6.15	8.50	7.00
28. 48-in. ext. str. rein. conc. pipe	84 l.f.	7.41	8.00	9.00
29. Concrete curb and gutter	244 l.f.	1.50	2.50	3.00
30. Right-of-way markers	38 ea.	2.00	3.00	2.00
31. Timber post guard fence	608 ea.	2.50	2.50	3.00
32. Remove and replace timber post guard fence	302 ea.	1.50	1.50	1.00
33. Grouted rock retards	188 c.y.	10.00	5.00	10.00

FOUNDATION WALLS, DUQUESNE WAY, PITTSBURGH

OWNER: Allegheny County Commissioners, Pittsburgh, Pa.

PROJECT: Reconstruction of Water Street and Duquesne Way (Contract 11) including foundation and retaining walls for upper west-bound roadways. Involves all required excavation, embankment, culverts, manholes and catchbasins, gratings, demolition, and concrete work.

CONDITIONS: Contractor to furnish all material, tools, plant and equipment, and complete work in 240 days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.50 per hr. (average); semi-skilled, $1.00; and common, 65 to 80c.

BIDS: Five bids were opened July 22, 1941, ranging from the contract low of $540,914 to $689,995.

LIST OF BIDDERS:

1. John F. Casey Co., Aspinwall, Pa. (contract) $540,914
2. Frank Donatelli Co., Inc., Pittsburgh, Pa. 583,435
3. Dinardo, Inc., Pittsburgh, Pa. 583,715
4. Navarro Corp., Pittsburgh, Pa. 632,927
5. George Vang, Inc., Pittsburgh, Pa. 689,995

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, Class I	7,500 c. yd.	$0.40	$0.60	$1.00
2. Add'l. compensation for removal and disposal of artificial underground structures	10 ea.	5.00	5.00	3.00
3. Embankment, granulated slag	68,000 c. yd.	.60	.55	.65
4. Conc., Cl. B, end walls and footings	8 c. yd.	25.00	25.00	35.00
5. 10-in. c. i. pipe sewer, incl. spec.	60 l. f.	5.20	4.50	10.00
6. 12-in. rein. conc. pipe culvert	60 l. f.	2.50	2.50	4.00
7. 15-in. rein. conc. pipe culvert	108 l. f.	3.00	4.00	4.00
8. Brick catch basin, type 1 (city std.) incl. all castings	1 ea.	285.00	175.00	150.00
9. Brick catch basin, type 1	1 ea.	285.00	175.00	150.00
10. Spec. brick manhole for City Water Bur.	1 ea.	500.00	275.00	1,600.00
11. Brick manhole on r.c. chamber (Cl. B)	5 ea.	1,000.00	850.00	1,750.00
12. Spec. br. manhole on r.c. chamber (Cl. B)	1 ea.	500.00	1,000.00	1,500.00
13. Spec. rein. conc. (Cl. B) storm inlet	1 ea.	100.00	175.00	125.00
14. Extra depth manholes	20 l. f.	40.00	10.00	30.00
15. Malleable iron gratings (Cast No. 19)	3 ea.	20.00	25.00	25.00
16. Demolish frame office bldg.	L.S.	20.00	10.00	50.00
17. Demolish conc. fl. and columns	L.S.	2,500.00	500.00	2,000.00
18. Demolish frame structure	L.S.	50.00	10.00	50.00
19. Excavation, Class II	7,000 c. yd.	1.25	1.00	2.00
20. Conc., Cl. A-S, facing of stone abut.	310 c. yd.	40.00	25.00	45.00
21. Conc., Cl. A-S, encasing steel columns	50 c. yd.	40.00	25.00	45.00
22. Conc., Cl. B, walls, abuts. and footings	12,200 c. yd.	16.00	20.00	18.00
23. Med. carb. steel for anchor bolts; and misc. pieces wr. iron for ladders	14,000 lb.	.20	.15	.25
24. Copper, in place	5,500 lb.	.60	.50	.60
25. Steel reinforcing bars	1,020,000 lb.	.05	.06	.06
26. Piles; conc. cast-in-place, st. shell	60,000 l. f.	2.25	2.25	2.50
27. Sheeting, shoring and bracing, left in place	20 Mbm.	30.00	30.00	30.00
28. Steel sheet piling, left in pl.	5,000 s. f.	.10	.50	1.00
29. Mooring rings, incl. castings and fastenings	38 ea.	175.00	150.00	90.00
30. Holes drilled in stone or conc.	850 l. f.	.60	.75	125.00
31. Contr. tools, plant, equip. and overhd.	L.S.	47,000.00	42,850.00	15,000.00

HIGHWAY AND BRIDGE
COLORADO

OWNER: Colorado State Highway Department, Denver. C. D. Vail, engineer.

PROJECT: Improvement of highway between Brush and Sterling, Logan and Washington Counties, Colorado. Includes 0.409 miles of highway, two bridge structures, and gravel approaches. One bridge of concrete and I-beam steel construction, one span 60-ft. in length, 12-ft. clearance above stream bed; other involves concrete box culvert widening, 13-ft. on each side of existing structure. Skew culvert 46-ft. long.

CONDITIONS: Contractor to furnish all materials and complete work in 400 calendar days. Rail and highway transportation facilities available. Minimum wage rates are: skilled labor, $1.10 per hr.; semi-skilled, 70c.; and common, 50c. Project has no priority rating, and some difficulty may be expected in procuring needed structural and reinforcing steel.

BIDS: Six bids were opened November 6, 1941, ranging from the contract low of $28,507 to $30,825. Engineer's estimate, $25,199.

LIST OF BIDDERS:

1. Lawrence Constr. Co., Denver, Colo. (contract) $28,507
2. Colorado Bridge and Constr. Co., Denver, Colo. 29,422
3. Frank M. Kenney, Denver, Colo. 30,282
4. Steinwald & Watts, Denver, Colo. 30,492
5. Henry Shore, Littleton, Colo. 30,573
6. J. H. & N. M. Monaghan, Denver, Colo. 30,825

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove bridge, Sta. 825	L. S.	$450.00	$500.00	$250.00
2. Remove two structures	L. S.	50.00	15.00	20.00
3. Remove structure, Sta. 834	L. S.	150.00	100.00	50.00
4. Remove, prepare bridge, Sta. 834	L. S.	350.00	150.00	500.00
5. Remove concrete pavement	200 s. y.	1.00	.50	.50
6. Remove detour bridge	L. S.	200.00	100.00	150.00
7. Remove, rebuild fence	4,300 l. f.	.10	.05	.08
8. Line posts, metal	140 ea.	1.00	1.00	1.25
9. Unclassified excavation	5,000 c. y.	.40	.33	.50
10. Unclassified ditch excavation	300 c. y.	.50	.60	.50
11. Dry common excavation, structures	135 c. y.	1.25	1.20	1.20
12. Wet common excavation, structures	125 c. y.	5.00	4.00	2.00
13. Mechanical tamping	52 hr.	3.00	4.00	5.00
14. Rolling fills	65 hr.	4.00	7.00	3.00
15. Furnish roller unit	2 ea.	100.00	250.00	100.00
16. Wetting fills	79 M gal.	1.75	4.00	3.00
17. Overhaul	48,000 sta. y.	.02	.02	.01
18. Overhaul	800 y. mi.	.20	.20	.06
19. Sand cushion	10 c. y.	1.00	2.00	2.00
20. Gravel surfacing	1,020 ton	1.00	1.00	1.50
21. Gravel stockpile	380 ton	1.00	.70	1.30
22. Gravel overhaul	1,000 ton mi.	.10	.07	.08
23. Untreated bridge timber	11.5 M bm.	100.00	100.00	120.00
24. Class A concrete	271 c. y.	25.00	26.50	26.00
25. Class B concrete	3 c. y.	25.00	26.50	26.00
26. Class A conc. handrail	7 c. y.	50.00	60.00	50.00
27. Reinforcing steel	29,200 lb.	.08	.08	.07
28. Structural steel	59,900 lb.	.08	.08	.09
29. 18-in. corr. metal pipe culv.	56 l. f.	1.75	2.00	2.00
30. 36-in. corr. metal pipe culv.	35 l. f.	5.00	6.00	4.50
31. Treated timber piling	480 l. f.	1.50	1.50	1.30
32. Untreated timber piling	440 l. f.	1.30	1.40	1.20
33. Precast concrete piling	420 l. f.	6.00	7.50	8.50
34. Riprap	80 c. y.	4.00	6.00	3.50
35. Barb wire gates	2 ea.	10.00	10.00	10.00
36. Project marker	2 ea.	25.00	25.00	25.00
37. Right-of-way marker	11 ea.	5.00	5.00	5.00
38. Drain pipe, 4-in. by 5-ft	4 ea.	7.00	8.00	6.00
39. Timber guard post	77 ea.	2.25	3.00	3.00

HIGHWAY AND BRIDGES
PENNSYLVANIA

OWNER: Pennsylvania State Highway Dept., Harrisburg; T. C. Frame, chief engr.

PROJECT: Construction of 22-ft. reinforced concrete pavement, structures and bridges, Legislative Route 212 in Bradford County, between North Towanda and Burlington Townships, Pa. Length of project 23,740 feet. Involves construction on one plate girder bridge with two 95-ft. spans; one plate girder bridge with two 97-ft. spans; one reinforced concrete arch extended, 20-ft. span; and three reinforced concrete boxes.

CONDITIONS: Contractor to furnish all materials and complete work in 350 calendar days. Highway transportation facilities available. Minimum wage rates are: skilled labor, 75c. per hr.; semi-skilled labor 50c.; and common, 45c.

BIDS: Seven bids were opened August 29, 1941, ranging from the contract low of $541,433 to $690,467.

LIST OF BIDDERS:

1. A. B. Cole, Meshoppen, Pa. (contract) $541,433
2. Central Pennsylvania Quarry, Stripping & Construction Co., Hazelton, Pa. 562,510
3. H. J. Williams Co., Inc., York, Pa. 593,602
4. Joseph Banks Constr. Co., Wilkes-Barre, Pa. 596,224
5. N. R. Corbisello, Binghamton, N. Y. 654,085
6. Putman & Greene, Inc., Fort Wayne, Ind. 663,447
7. M. Bennett & Sons, Indiana, Pa. 690,467

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	L. S.	$5,000.00	$5,000.00	$15,000.00
2. Class 1 excavation	338,095 c. y.	.50	.50	.45
3. Class 2 excavation	6,347 c. y.	2.00	2.00	2.50
4. Borrow excavation	1,009 c. y.	.50	.30	.45
5. Subgrade	62,041 s. y.	.10	.12	.14
6. Shoulders	24,544 l. f.	.20	.20	.20
7. Native stone, type B, or cr. aggregate base course, 8-in.	3,904 s. y.	.80	1.35	1.00
8. Plain cem. conc. pavmt., 6-in.	92 s. y.	2.00	2.60	2.55
9. Cement concrete pavement, 9-in.	58,045 s. y.	2.50	2.60	2.75
10. Reinforcement in cem. conc. pavmt.	58,045 s. y.	.20	.20	.20
11. Cem. conc. wearing surf.; brdge. floors.	944 s. y.	2.00	2.60	2.30
12. Reinforcing in Item 11	944 s. y.	.20	.20	.22
13. Bitum. surf. course HE-1, 2-in.	3,797 s. y.	1.00	1.10	1.10
14. Class A concrete	641 c. y.	20.00	25.00	25.00
15. Class B concrete	3,528 c. y.	18.00	21.00	24.00
16. Plain steel bars	279,964 lb.	.05	.045	.065
17. Fabricated structural steel	633,886 lb.	.08	.08	.09
18. Stone backfill, structures	129 c. y.	3.00	2.25	4.00
19. Stone backfill, misc. drainage	7 c. y.	3.00	2.25	3.00
20. Cl. B cem. conc. slope wall (spillway)	14 c. y.	15.00	21.00	22.00
21. Cl. B. cem. conc. pavmt., 6-in. (str. beds)	4 c. y.	15.00	21.00	20.00
22. 15-in. cast iron pipe	68 l. f.	3.00	3.40	4.50
23. Interlocking style c. i. pipe, 18-in.	86 l. f.	4.00	4.10	5.50
24. 15-in. corr. metal pipe	290 l. f.	2.50	2.30	3.00
25. 18-in. corr. metal pipe	60 l. f.	3.00	3.00	3.50
26. 15-in. rein. cem. conc. pipe	800 l. f.	2.50	2.30	3.50
27. 18-in. rein. cem. conc. pipe	356 l. f.	3.00	3.00	4.00
28. 24-in. rein. cem. conc. pipe	514 l. f.	4.10	4.40	6.00
29. 30-in. rein. cem. conc. pipe	62 l. f.	6.60	5.90	7.00
30. 36-in. rein. cem. conc. pipe	284 l. f.	8.00	7.00	8.00
31. Ext. str. rein. cem. conc. pipe, 36-in.	238 l. f.	10.00	7.40	8.50
32. 4-in. tile underdrain	5,000 l. f.	.80	.75	.80
33. 6-in. tile foundation underdrain, type A.	3,484 l. f.	1.00	.80	.80
34. 4-in. tile outlets	522 l. f.	.80	.45	.65
35. Subgrade drains	4,500 l. f.	.30	.50	.40
36. Plain cem. conc. gutter (segmental)	1,228 s. y.	3.00	2.50	3.25
37. Type 1-B, 2-B, 3-B or 4-B guard fence	15,904 l. f.	.60	.63	.60
38. Type 1, 2, 3 or 4 end anchorages	54 ea.	20.00	24.00	25.00

HIGHWAY AND BRIDGE, OHIO

OWNER: Ohio State Highway Department, Columbus, Ohio.

PROJECT: Grading, drainage structures, reinforced concrete and monolithic brick paving Sections Athens E and C-1 of State Highway 155, Athens County, Ohio. Also involves construction of steel beam bridge over Sugar Creek, three spans of 32, 40 and 32-ft., respectively. Bridge roadway width 28 ft. Entire project is 2.726 miles in length. Width of roadway varies from 24 to 48 ft.

CONDITIONS: Contractor to furnish all materials and complete work by July 31, 1942. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 60c. to $1.25; and common, 50 to 55c.

BIDS: Two bids were opened April 29, 1941, the contract low of $442,245, and $492,225. Engineer's estimate, $501,000.

LIST OF BIDDERS:

1. W. P. McCarren, Walhonding, Ohio (contract) $442,245
2. Ralph Myers Constr. Co., Salem, Ind 492,225

Item	Quan.	Unit Prices (1)	(2)	(3)*
1. Roadway excavation, unclass.	523,289 c. y.	$0.34	$0.42	$0.45
2. Unclass. structure excav.	85 c. y.	1.00	1.00	1.50
3. Channel excav. (to supply borrow)	3,100 c. y.	.40	.40	.60
4. Remove, dispose exist. conc. pavmt.	2,129.8 s. y.	.20	.20	.30
5. Remove, dispose conc. base and curb	3,260.9 s. y.	.30	.20	.32
6. Remove brick wearing crse. for reuse	22.2 s. y.	.30	.25	.40
7. Remove, store exist. brick pavmt.	21,074.8 s. y.	.25	.20	.20
8. Remove, dispose 6-in. sandstone base	1,541.7 s. y.	.10	.10	.03
9. Remove, dispose exist. 4-in. conc. sidewk.	500 s. f.	.02	.05	.02
10. Remove, dispose 6x18-in. conc. curb	21,446 l. f.	.02	.04	.02
11. Water (estimated)	2,497 M. gal.	2.00	2.00	2.30
12. 12-in. corr. metal pipe, driveways	114 l. f.	1.25	1.20	1.35
13. 15-in. corr. met. pipe, driveways	100 l. f.	1.50	1.40	1.70
14. 12-in. rein. conc. pipe, storm sewers	46 l. f.	1.75	1.35	1.50
15. 12-in. paved bit. coat. c.m. pipe or paved invert corr. met. pipe, storm sewer outlets	205 l. f.	2.00	1.75	1.40
16. 8-in. helical perf. corr. met. pipe, rdwy. drain., full depth porous bkfill	1,236 l. f.	1.50	1.35	1.25
17. 6-in. ex. qual. drain tile, underdrains	1,530 l. f.	.50	.85	.99
18. 6-in. helical perf. corr. met. pipe, underdrains	1,000 l. f.	1.50	.80	1.15
19. 4-in. ex. qual. drain tile, underdrains	306 l. f.	.50	.75	.40
20. 6-in. corr. met. pipe, outlet for underdr.	20 l. f.	1.00	.80	1.15
21. 12-in., 20-deg. bend pipe specials	6 ea.	7.00	3.50	1.50
22. 6-in. wye pipe spec., underdrains	15 ea.	1.00	1.50	1.50
23. 6x4-in. wye pipe spec., full depth porous bkfill, rdway drainage	3 ea.	1.50	2.75	1.50
24. Class E conc., structures	95 c. y.	18.00	19.00	18.50
25. Drain basin, No. 1	1 ea.	100.00	50.00	60.00
26. Std. No. 3 catch basins	4 ea.	100.00	120.00	90.00
27. 18-in. type A riprap	36 s. y.	2.50	3.25	3.50
28. 4-in. conc. sidewalks (1 crse. constr.)	11,533.5 s. f.	.20	.20	.20
29. Paved gutter	1,056 l. f.	2.00	1.50	.85
30. Drain outlets	81 l. f.	1.00	1.50	1.20
31. Remove, store Type P-C guard rail	2,668 l. f.	.10	.20	.10
32. Aggregate, traffic bound side appr.	530.3 c. y.	1.50	3.00	2.00
33. Remove and dispose of 10-in. pipe	66 l. f.	.20	.20	.10
34. Remove and dispose of 12-in. pipe	830 l. f.	.20	.20	.12
35. Remove and dispose of 15-in. pipe	31 l. f.	.25	.20	.15
36. Remove and dispose of 18-in. pipe	64 l. f.	.25	.25	.15
37. Remove and dispose of 24-in. pipe	127 l. f.	.25	.30	.20
38. Remove existing structures	L.S.	300.00	200.00	250.00
39. Seed and protect rdwy. areas	127,000 s. y.	.01	.04	.04
40. Calcium chloride for traffic lanes	15 ton	30.00	30.00	25.00
41. Aggregate, traffic compacted lanes	3,200 c. y.	1.50	3.00	1.80
42. Std. str. flex. steel plate tens. type guard rail, or steel beam type guard rail	5,215 l. f.	.90	.95	1.05
43. Sodding	565 s. y.	.20	.20	.30
44. 7-in. rein. portland cem. conc. base crse.	13,533 s. y.	2.00	2.00	1.98
45. 9-7-7-9-in. rein. port. c. c. base crse.	30,539.2 s. y.	2.00	2.00	2.00
46. Bitum. impregnated paper insulation crse.	14,349 s. y.	.03	.02	.05
47. Completed mixture, del'd without chem.	205.3 ton	2.75	3.50	2.20
48. Spreading, shaping, compacting	616 s. y.	.15	.10	.20
49. Surf. trtmt. (seal coat) aggregate	2.3 ton	3.00	3.00	3.20
50. Surf. trtmt. (seal coat) bitum. mat'l	124 gal.	.25	.18	.18
51. Bituminous prime coat	155 gal.	.25	.18	.18
52. Surf. treatment bitum. material	321 gal.	.25	.18	.18
53. Surf. trtmt. cover aggregate, No. 46	10.7 ton	3.00	3.00	3.10
54. 7-in. portland cement conc. pavement	67.3 s. y.	2.00	2.10	1.90
55. Port. cement conc. medina strip	42 s. y.	3.00	2.10	2.75
56. 9-7-7-9-in. rein. port. c. c. pavmt.	2,210 s. y.	2.00	2.10	2.15
57. 3-in. monolithic brick surf. crse.	44,072.2 s. y.	1.90	1.85	1.75
58. Salvage brick surf. crse. complete	222 s. y.	1.00	.90	.60
59. Type A concrete curb	5,080.2 l. f.	.07	.50	.65
60. Type 2 conc. curb and 2-ft. wide gutter	22 l. f.	2.00	1.50	.90
61. Type 4 conc. curb and gutter	360 l. f.	1.00	1.50	1.10
62. 9-in. rein. conc. approach slab	86.7 s. y.	6.50	3.50	4.20
63. Und. excavation, structures	1,074 c. y.	1.00	1.00	1.50
64. Channel excavation	1,082 c. y.	.75	.40	.60
65. Class C concrete	55.4 c. y.	20.00	19.00	17.25
66. Reinforcing steel	752 lb.	.05	.05	.06
67. 12-in. rein. conc. pipe, rdwy. culv.	278 l. f.	1.50	1.35	1.25
68. 15-in. rein. conc. pipe, rdwy. culv.	1,254 l. f.	1.75	1.60	1.60
69. 18-in. rein. conc. pipe, rdwy. culv.	676 l. f.	3.00	2.00	2.00
70. 24-in. rein. conc. pipe, rdwy. culv.	519 l. f.	2.75	3.00	3.00
71. 48-in. rein. conc. pipe, rdwy. culv.	268 l. f.	6.50	9.50	9.00
72. 24-in. 10-gage paved bit. coat. corr. met. pipe; or paved invert c.m. pipe	604 l. f.	6.00	4.75	3.50
73. 18-in., as above	256 l. f.	2.50	3.00	2.00
74. 12-in. rein. conc. pipe, rdwy. culv. outlet	71 l. f.	1.50	1.35	1.25
75. Standard No. 1-2 catch basins	15 ea.	50.00	50.00	40.00
76. Standard No. 1-3 catch basins	3 ea.	75.00	65.00	60.00
77. Standard No. 3 catch basins	3 ea.	125.00	60.00	90.00
78. Standard No. 3A catch basins	11 ea.	110.00	60.00	60.00
79. Standard No. 9A catch basins	9 ea.	125.00	90.00	100.00
80. Standard No. 1 manhole, modified	1 ea.	100.00	100.00	80.00
81. Type A grouted riprap	16.9 s. y.	2.50	3.00	2.50
82. 12-in. rein. conc. pipe, storm sewer	40 l. f.	1.50	1.35	1.50
83. 15-in. rein. conc. pipe, storm sewer	80 l. f.	1.75	1.65	2.00
84. 18-in. rein. conc. pipe, storm sewer	46 l. f.	2.25	2.40	2.50
85. 24-in. rein. conc. pipe, storm sewer	45 l. f.	3.75	3.50	3.50
86. 12-in. 20-deg. bend spec., rdwy. culv. outlet	4 ea.	7.00	3.50	2.00
87. Earth excavation, structures	202 c. y.	1.00	1.00	3.50
88. Class C conc., superstructure	96 c. y.	25.00	24.00	26.00
89. Class E conc., walls	162 c. y.	20.00	20.00	19.50
90. Class E conc., footings	37 c. y.	15.00	19.00	15.00
91. Type B waterproofing	28 s. y.	1.50	1.75	1.75
92. Reinforcing steel	25,520 lb.	.05	.05	.055
93. Structural steel	67,500 lb.	.06	.09	.065
94. Field painting of struct. steel	67,500 lb.	.003	.01	.003
95. Bridge railing (steel with conc. posts)	211.3 l. f.	5.00	2.00	7.00
96. First test pile (timber, incl. steel point)	L.S.	200.00	200.00	220.00
97. First test pile (10-in. H at 42 lb.)	L.S.	300.00	392.00	216.00
98. Standard timber piling	1,500 l. f.	.60	.70	.85
99. Steel pile points	44 ea.	1.25	.90	2.00
100. Steel piling (10-in. H at 42 lb.)	900 l. f.	1.50	2.00	2.20
101. Premium on industrial insurance	L.S.	5,000.00	3,000.00	6,354.69
102. Maintain traffic, etc.	L.S.	3,000.00	7,000.00	4,000.00

*Engineer's estimate.

CAUSEWAY, MICHIGAN

OWNER: Michigan State Highway Dept.

PROJECT: Construction of 4,085-ft. causeway, north shore of Straits of Mackinac, Mackinac County, Mich. Roadway width 44-ft., 12-ft. shoulders. Bridge, 90-ft. long 840-ft. from shore to permit small boat passage. Also includes settlement gages.

CONDITIONS: Contractor to furnish all materials except 5 and 10-ton stone which is furnished under another contract. Core of fill to be excavated near site of work. Completion date June 1, 1942. Weather and wind conditions make transportation by barge difficult as depth of water near work is only from 5 to 12-ft. Rail transportation available. Wage rates are: skilled labor $1.12½ per hr.; semi-skilled 75c.; and common, 50c.

BIDS: Eight bids were opened August 20, 1941, ranging from the contract low of $616,160 to $1,302,610.

LIST OF BIDDERS:

1. Johnson & Greene, Whitmore Lake, Mich. (contract) $616,160
2. Wm. J. Meagher & Sons, Alpine Excavation Co., Claude M. Loomis, Bay City and St. Ignace, Mich. 731,395
3. Bridgeport Core Sand Co., and Luedtke Engr. Co., Saginaw and Frankfort, Mich. 772,861
4. Bacco Constr. Co., Iron Mountain, Mich. 783,529
5. Hamer Bros. Inc., Detroit, Mich.; Jutton & Kelly Co., Milwaukee, Wis.; L. A. Davidson, Lansing, Mich. 802,522
6. Cooke Contracting Co., Detroit, and Marsman & Taber, Grand Rapids, Mich. 822,131
7. Great Lakes Dredge & Dock Co., Chicago, Ill. 888,938
8. William Gilliland, Alpena, Mich. 1,302,610

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	12.5 ac.	$60.00	$75.00	$100.00
2. Grubbing	2,000 s. rd.	.60	.75	.70
3. Borrow excavation, earth	122,300 c. y.	.10	.19	.25
4. Overhaul, earth	53,100 c.y.mi.	.06	.12	.15
5. Borrow excavation, rock	214,000 c.y.	.67	.975	1.18
6. Overhaul, rock	140,000 c.y.mi.	.09	.16	.20
7. Selected rock borrow, 1 to 5 ton	9,800 c.y.	3.00	1.75	3.25
8. Quarry stone, 1 to 5 ton	14,700 ton	4.00	4.50	4.00
9. Quarry stone, 10-ton. min.	61,400 ton	4.50	4.90	4.50
10. Quarry stone, 5-ton. min.	11,900 ton	4.40	4.60	4.40
11. 60-in. corr. metal pipe	106 l. f.	10.00	12.85	18.50
12. 6-in. std. black pipe casing	460 l. f.	6.00	5.00	6.00
13. 2-in. std. black pipe	750 l. f.	2.00	1.00	2.00
14. Tremie concrete	47 c. y.	20.00	35.00	35.00
15. Cement	74 bbl.	2.00	2.50	2.50
16. Steel piles — furnished	606 l. f.	2.50	3.40	2.50
17. Steel piles — driven	558 l. f.	3.00	2.50	3.00
18. Grade B concrete, substructure	49 c. y.	16.00	30.00	30.00
19. Grade B concrete, superstructure	188 c. y.	18.00	30.00	30.00
20. Cement	308 bbl.	2.00	2.50	2.50
21. Reinforcing steel	33,082 lb.	.05	.06	.06
22. Fabr. and erect struct. steel	108,600 lb.	.075	.07	.075
23. Bridge railing	180 l. f.	6.00	8.50	10.00
24. Field painting	L. S.	200.00	350.00	200.00
25. Rubbed surface finish	740 s. f.	.10	.10	.15
26. ½-in. cork filler	200 s. f.	.50	.60	.80
27. Sheet copper	320 lb.	1.00	.50	1.00

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HIGHWAY OVERPASS, VERMONT

OWNER: Vermont State Highway Department, Montpelier.

PROJECT: Construction of an 889.5-ft. highway overpass. Consists of nine spans, one a wide flange beam girder and the balance a combination of cantilever and continuous girders. Two lane roadway. Located on U. S. Route 2, St. Johnsbury, Vt.

CONDITIONS: Contractor to furnish all materials and complete work by August 1, 1942. Rail and highway transportation facilities available. Project is in heavily settled area, and changes to public and private utilities affect construction. There may also be difficulty in obtaining structural steel. Wage rates: skilled labor, 60c. per hr.; semi-skilled, 45c.; common, 40c.

BIDS: Six bids were opened June 13, 1941, ranging from the contract low of $289,760 to $328,389.

LIST OF BIDDERS:

1. Charles I. Hosmer, Inc., Greenfield, Mass. (contract) $289,760
2. O. W. Miller Co., Inc., Ludlow, Mass. 293,725
3. Carlo Bianchi & Co., Framingham, Mass. 309,084
4. Derrick DeGroot, Jericho, Vt. 315,399
5. The Lane Constr. Co., Meriden, Conn. 321,462
6. B. A. Simeone, Inc., Medford, Mass. 328,389

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Solid rock excavation	80 c. y.	$3.00	$4.00	$4.00
2. Common excav., incl. borrow	6,500 c. y.	.60	.45	.60
3. Trench excavation, earth	830 c. y.	1.00	2.00	1.25
4. Trench excavation, rock	270 c. y.	5.00	5.00	4.00
5. Structure excavation	2,353 c. y.	4.00	3.00	6.60
6. Maintain traffic (F. tr. only)	L.S.	500.00	2,000.00	1,000.00
7. Maintain traffic (local tr. only)	L.S.	1,000.00	1,100.00	500.00
8. Sub-base of gravel	1,900 c. y.	.60	.60	.75
9. Cr. gravel, mixed-in-place surf. crse	180 c. y.	5.50	6.00	5.00
10. Double tack coat of refined tar	150 gal.	.14	.20	.50
11. Refined tar	4,300 gal.	.14	.15	.16
12. Cement concrete pavement	480 c. y.	14.00	17.00	12.00
13. Class A concrete	2,642 c. y.	23.00	22.50	24.00
14. Reinforcing steel	307,300 lb.	.05	.055	.046
15. Steel superstr. (1,820,200 lb.)	L.S.	177,965.00	178,500.00	190,000.00
16. Cement rubble masonry	140 c. y.	10.00	15.00	15.00
17. 12-in. rein. conc. pipe	140 l. f.	1.50	1.65	1.50
18. 24-in. rein. conc. pipe	64 l. f.	3.25	4.00	4.00
19. 12-in. corr. galv. metal pipe	338 l. f.	1.50	2.00	1.75
20. 12-in. corr. galv. pipe, metal, asph. coated	196 l. f.	1.75	2.00	2.00
21. 15-in., as above	20 l. f.	2.00	2.30	2.50
22. 24-in. as above	38 l. f.	4.00	4.00	4.00
23. 12-in. vit. clay pipe, dbl. str.	310 l. f.	.70	1.25	1.50
24. 15-in. vit. clay pipe, dbl. str.	76 l. f.	1.10	1.65	2.00
25. 18-in. vit. clay pipe, dbl. str.	8 l. f.	1.50	2.00	3.00
26. Std. underdrain with 6-in. pl. corr. galv. met. pipe, asph. coat	40 l. f.	1.25	1.00	2.00
27. Pl. cement conc. gutter	10 c. y.	15.00	16.00	15.00
28. Cable guard rail	96 l. f.	.60	.60	1.00
29. Anchors for cable guard rail	4 ea.	12.00	12.00	20.00
30. Erect state or F. A. markers	2 ea.	15.00	15.00	25.00
31. Brick catch basins or manholes	16 ea.	80.00	125.00	75.00
32. Drop inlet grates	7 ea.	15.00	15.00	20.00
33. Cement concrete sidewalk	409 s. y.	2.00	3.00	1.50
34. Conduit for lighting system	L.S.	2,600.00	2,750.00	3,000.00
35. Fin. grade, fertilize and sod	400 s. y.	.20	.25	1.00
36. Comm. fertilizer for grasses	100 lb.	.10	.05	.25
37. Grass seed	10 lb.	.75	.50	1.00
38. Grass sod	400 s. y.	.75	.75	.75
39. Cut and remove trees	10 ea.	25.00	20.00	20.00

SPOKANE STREET VIADUCT SEATTLE, WASHINGTON

OWNER: Washington State Highway Department, Olympia, Wash.; B. Bantz, state highway director.

PROJECT: Construction of a steel, reinforced concrete and timber overcrossing structure and approach ramps, Spokane St., Seattle, Wash. Viaduct to have concrete deck. Approximate length 0.8 miles. Alternate was allowed for creosoted timber or concrete approaches. Contract awarded on basis of latter.

CONDITIONS: Contractor to furnish all materials and complete work in 360 calendar days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $2.00 per hr.; semi-skilled, $1.50; and common, $1.10.

BIDS: Four bids were received December 23, 1941, on the concrete approach basis, ranging from the contract low of $968,855 to $1,163,523. Two bids were opened on the timber approach alternate, $1,008,829 and $1,010,700.

LIST OF BIDDERS:

1. MacRae Brothers, Seattle, Wash. (contract) $968,855
2. Erickson Paving Co., and H. Hagman, Seattle, Wash.
   (concrete approach) 1,039,750
   (timber approach) 1,010,700
3. Macri & Mullen, Seattle, Wash. (concrete approach) 1,111,143
   (timber approach) 1,008,829
4. Western Construction Co., Seattle, Wash 1,163,523

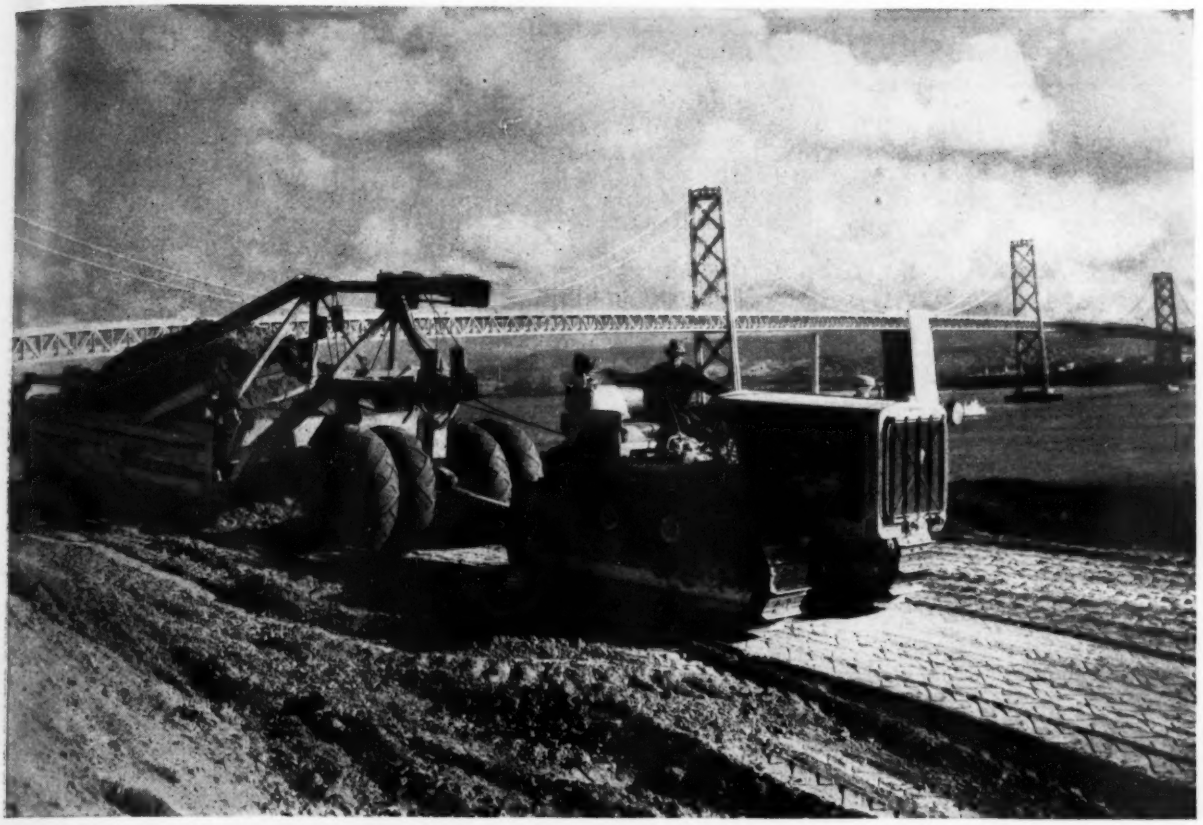
Item	Quan.	Unit Prices (1)	(2)	(3)
1. Structure excavation	6,900 c. y.	$3.35	$4.00	$5.00
2. Furn. timber piling (untr.)	69,300 l. f.	.23	.25	.25
3. Drive untr. timber piles	1,554 ea.	11.50	12.00	11.88
4. Furn. timber piling (creosoted)	18,900 l. f.	.72	.67	.88
5. Drive creosoted timber piles	427 ea.	11.00	13.00	15.62
6. Timber and lumber (untr.)	355 M bm.	74.00	70.00	87.50
7. Timber and lumber (creosoted)	33 M bm.	103.00	110.00	137.50
8. Steel railroad rails (used)	8,700 lb.	.0325	.12	.065
9. Earth fill in appr. ramps	5,200 c. y.	.85	1.25	1.88
10. Remove exist. concr. pavement	425 s. y.	1.00	1.00	1.25
11. Remove exist. concr. curbs	1,890 l. f.	.25	.55	.63
12. Class D excav., incl. bkfill	740 c. y.	1.45	5.00	1.88
13. 12-in. vitr. clay sewer pipe	154 l. f.	1.80	1.50	1.88
14. 15-in. vitr. clay sewer pipe	88 l. f.	2.10	2.00	2.19
15. 21-in. vitr. clay sewer pipe	281 l. f.	3.85	3.25	3.13
16. 27-in. vitr. clay sewer pipe	283 l. f.	7.00	6.00	6.25
17. Sew. manholes with exist. ring and cover	2 ea.	95.00	150.00	143.75
18. Sewer manholes	11 ea.	120.00	200.00	162.50
19. 6-in. vitr. clay sewer pipe	120 l. f.	1.50	1.00	1.57
20. Class A conc. (struct. and deck steel spans)	8,740 c. y.	29.00	30.00	30.00
21. Class A conc. (deck on timber spans)	919 c. y.	32.00	30.00	29.00
22. Concrete Class B	407 c. y.	26.00	30.00	29.00
23. Class C concrete	34 c. y.	25.00	30.00	31.25
24. Class F concrete	720 c. y.	24.00	30.00	27.50
25. Cem. conc. pavmt. std. 14-day mix (10-7-10-in.)	2,060 s. y.	2.70	2.00	4.38
26. Cem. conc. pavmt. std. 14-day mix (8-in.)	3,260 s. y.	2.00	2.50	3.44
27. Type A curbs	3,140 l. f.	.50	1.75	1.88
28. Extra for furn. H. E. S. cem. in place of standard	720 bbl.	.60	.70	.75
29. Dowel bars without caps (std.)	1,620 ea.	.20	.22	.38
30. Dowel bars with caps (std.)	740 ea.	.30	.30	.44
31. Steel reinforcing bars	2,844,000 lb.	.05	.055	.0675
32. Struct. steel	2,376,800 lb.	.08	.095	.09
33. Cast steel	25,700 lb.	.25	.30	.45
34. Forged steel	11,100 lb.	.35		.45
35. Trolley protect. and gd. fence	L.S.	1,110.00	1,500.00	1,500.00
36. Locomotive blast protection	L.S.	1,177.00	1,200.00	1,500.00
37. Bridge drains	56 ea.	30.00	60.00	75.00
38. Downspouts	1,400 l. f.	4.10	2.00	2.50
39. Lighting system	L.S.	38,450.00	32,000.00	34,314.00
40. Precast white center curb	1,450 l. f.	2.25	2.25	1.25
41. Catch basin and inlet	L.S.	150.00	150.00	250.00

Schedule A—Four Side Ramps—Concrete

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Structure excavation	2,300 c. y.	$3.50	$4.00	$5.00
2. Furn. timber piling (untr.)	13,000 l. f.	.23	.22	.25
3. Driving timber piles (untr.)	336 ea.	11.00	12.00	11.88
4. Earth fill in side appr. ramps	3,200 c. y.	.85	1.25	1.88
5. Class A concrete	1,940 c. y.	31.00	30.00	29.00
6. Class F concrete	280 c. y.	24.00	30.00	29.00
7. Cem. conc. pavmt. std. 14-day mix, 10-7-10-in.	1,920 s. y.	2.70	2.00	4.38
8. Extra for furn. H. E. S. cem. in place of std.	180 bbl.	.60	.70	.75
9. Dowel bars without caps (std.)	510 ea.	.20	.22	.38
10. Dowel bars with caps (std.)	280 ea.	.30	.27	.44
11. Steel reinforcing bars	631,000 lb.	.05	.055	.0575
12. Structural steel	68,400 lb.	.07	.0925	.11
13. Forged steel	850 lb.	.25	.50	.45
14. Bridge drains	16 ea.	30.00	60.00	75.00
15. Downspouts	310 l. f.	5.00	2.00	2.50

Schedule B—Four Side Ramps—Timbers

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Structure excavation	150 c. y.	.....	$3.00	$5.00
2. Furn. timber piling (creosoted)	19,300 l. f.	.....	.92	.88
3. Driving timber piles (creosoted)	335 ea.	.....	12.00	15.62
4. Steel railroad rails (used)	21,900 lb.	.....	.12	.065
5. Earth fill in approach ramps	1,620 c. y.	.....	1.25	1.88
6. Class A concrete	765 c. y.	.....	30.00	29.00
7. Class C concrete	65 c. y.	.....	30.00	51.25
8. Cem. conc. pavmt. std. 14-day mix, 10-7-10-in.	1,675 s. y.	.....	2.00	4.38
9. Extra for furn. H. E. S. cem. in place of standard	70 bbl.	.....	.70	.75
10. Dowel bars without caps (std.)	510 ea.	.....	.22	.38
11. Dowel bars with caps (std.)	280 ea.	.....	.27	.44
12. Steel reinforcing bars	153,000 lb.	.....	.055	.0575
13. Struct. steel	68,400 lb.	.....	.0925	.11
14. Forged steel	6,290 lb.	.....	.50	.45
15. Bridge drains	16 ea.	.....	60.00	75.00
16. Downspouts	310 l. f.	.....	2.00	2.50
17. Timber and lumber (treated)	250 M bm.	.....	120.00	137.50



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BASCULE BRIDGE, FLORIDA

OWNER: Dade County Commissioners, Edmund Friedman, county engineer, Miami, Fla. J. E. Greiner Co., Baltimore, Md., consulting engineers.

PROJECT: Construction of 120-ft. bascule bridge and piers, over Biscayne Bay, a part of the Biscayne Causeway; roadway width 44-ft.; 80-ft. clear opening.

CONDITIONS: Contractor to furnish all materials and complete work by November 1, 1942. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.12½ to $1.62½ per hr.; semi-skilled, 65c. to $1.00; and common, 62½c.

BIDS: Two bids were opened July 8, 1941, the contract low of $288,377 and $394,680.

LIST OF BIDDERS:

1. Reed Constr. Co., Miami, Fla. (contract) $288,377
2. P. J. Carlin Constr. Co., New York, N. Y. 394,680

Item	Quan.	Unit Prices (1)	(2)
1. Wet excavation, bascule piers	1,990 c. y.	$5.75	$30.00
2. Untreated timber piling	9,300 l. f.	.325	.50
3. Drive untr. timber piling	9,300 l. f.	.488	.70
4. Tremie conc. seal for basc. piers	770 c. y.	21.55	25.00
5. Cl. A conc.; basc. piers and oper. house	1,890 c. y.	32.65	30.00
6. Reinforcing steel	230,000 lb.	.0556	.07
7. Protective coating conc. work	1,200 s. y.	1.08	2.00
8. Structural steel	665,000 lb.	.127	.18
9. Open grid steel decking	5,600 s. f.	3.75	3.00
10. Cast steel track girder plates and rolled steel segment. girder plates	30,400 lb.	.28	.25
11. Machinery equip. except speed reducers for basc. span	25,000 lb.	.50	.60
12. Speed reducers for basc. span	L. S.	2,708.00	3,000.00
13. Electrical equipment	L. S.	21,365.00	36,000.00
14. Roadway gates	6 ea.	602.00	1,500.00
15. Class A conc. in counterweights	147 c. y.	54.00	30.00
16. Operator's house	L. S.	2,945.00	5,000.00
17. Treated timber piles in fenders	4,600 l. f.	1.50	1.60
18. Treated timber in fenders	22 Mbm.	229.65	250.00

BRIDGE AND APPROACHES GEORGIA

OWNER: Georgia State Highway Department, Atlanta, Ga.

PROJECT: Construction of overhead bridge and concrete paved approaches at Central of Georgia RR. crossing of Atlanta-Griffin Road, near Experiment, Spalding County, Ga.

CONDITIONS: Contractor to furnish all materials and complete work in 180 working days. Highway transportation facilities available. Wage rates stipulated are: skilled labor, 60c. per hr.; semi-skilled, 40c.; and common, 30c.

BIDS: Eight bids were received January 3, 1941, ranging from the contract low of $44,590 to $59,408.

LOW BIDDERS:

1. John Monaghan, Inc., Pelham, Ga. (contract) $44,590
2. Coffee Constr. Co., Eastman, Ga. 45,546
3. S. B. Slack, Decatur, Ga. 47,071

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear and grub	L. S.	$250.00	$300.00	$120.00
1a. Clear and grub	L. S.	50.00	100.00	30.00
2. Common borrow excav., incl. shoulders	20,489 c. y.	.26	.30	.25
3. Ditch excavation	157 c. y.	.50	.30	.50
4. Hydraulic settlement of fills	5,000 c. y.	.05	.10	.04
5. Overhaul on excavation	398,208 sta. y.	.0012	.005	.003
6. 15-in. corr. met. pipe, sidedrain	40 l. f.	2.00	1.25	1.25
7. 15-in. corr. met. pipe sidedrain exten.	20 l. f.	2.00	1.25	1.25
8. 15-in. std. str. rein. conc. pipe, exten.	12 l. f.	2.50	1.50	1.50
9. Remove culvert pipe	18 l. f.	1.00	.50	.50
10. Remove and relay culv. pipe	20 l. f.	1.50	1.00	1.00
11. Retaining walls, conc.	59.04 c. y.	22.00	30.00	22.00
12. Cl. A conc. guard rail constr.	2.6 c. y.	24.00	30.00	30.00
13. Reinforcing steel	842 lb.	.06	.10	.053
14. Grassing shoulder slopes	34,833 s. y.	.03	.03	.023
15. Conc. right-of-way markers	6 ea.	3.00	2.00	2.50
16. Conc. excav. for rounded cut slopes	200 l. f.	.05	.04	.03
17. Riprap	80 s. y.	.50	.50	.50
18. Cem. grouted rubble flume	30 s. y.	2.00	3.00	2.50
19. Remove cem. grouted rubble spillways	5 ea.	5.00	5.00	3.00
20. Wire mesh guard fence, remove and store	1,620 l. f.	.12	.05	.06
21. Remove concrete paving	2,893.22 s. y.	.30	.30	.25
22. Remove, reset conc. r.-o.-w. markers	8 ea.	2.00	2.00	2.00
23. 9-6-9-in. pl. cem. conc. pavement	3,085.55 s. y.	2.40	2.10	2.30
24. Rein. conc. approach slabs	115.54 s. y.	4.50	4.50	5.00
25. Raised edge curb	2,374 l. f.	.05	.07	.07
26. Resilflex guard rail, type C conc. posts	1,472 l. f.	1.00	1.00	.91
27. Conc. spillways, type 1 and 2	6 ea.	22.00	25.00	18.00
28. 8-in. corr. met. pipe slope drain	116 l. f.	1.00	1.00	1.00
29. Conc. drop inlet spillways, type A	2 ea.	30.00	60.00	42.00
30. 9x6-in. conc. header, raised edge curb	29.8 l. f.	1.00	1.00	.70
31. Finish and dressing	28,333 s. y.	.013	.02	.03
32. 10-in. corr. metal pipe slope drain	120 l. f.	1.10	1.00	1.00
33. Class A. concrete	395 c. y.	25.50	26.00	30.00
34. Reinforcing steel	53,000 lb.	.045	.05	.053
35. Structural steel	L. S.	6,500.00	6,500.00	7,700.00
36. Timber piling treated (16 lb.)	2,440 l. f.	.80	.70	.90
37. Excavation, class 1	450 c. y.	4.50	1.50	1.70
38. Excavation, class 2	91 c. y.	2.00	2.00	2.00
39. Test piles	2 ea.	100.00	100.00	300.00
40. Clear and grub	L. S.	100.00	50.00	50.00
41. Remove existing bridge	L. S.	400.00	50.00	250.00

BRIDGE AND APPROACHES MONTANA

OWNER: Federal Works Agency, Public Roads Admin., Portland, Ore.; W. H. Lynch, district engineer.

PROJECT: Construction of steel and reinforced concrete bridge over Clark Fork River and tracks of Northern Pacific Railway, together with approach grading, surfacing, and bituminous surfacing Yellowstone Trail Highway, Cabinet National Forest, Mineral County, Montana. Bridge approximately 0.1489 mi. long, and has 26-ft. roadway.

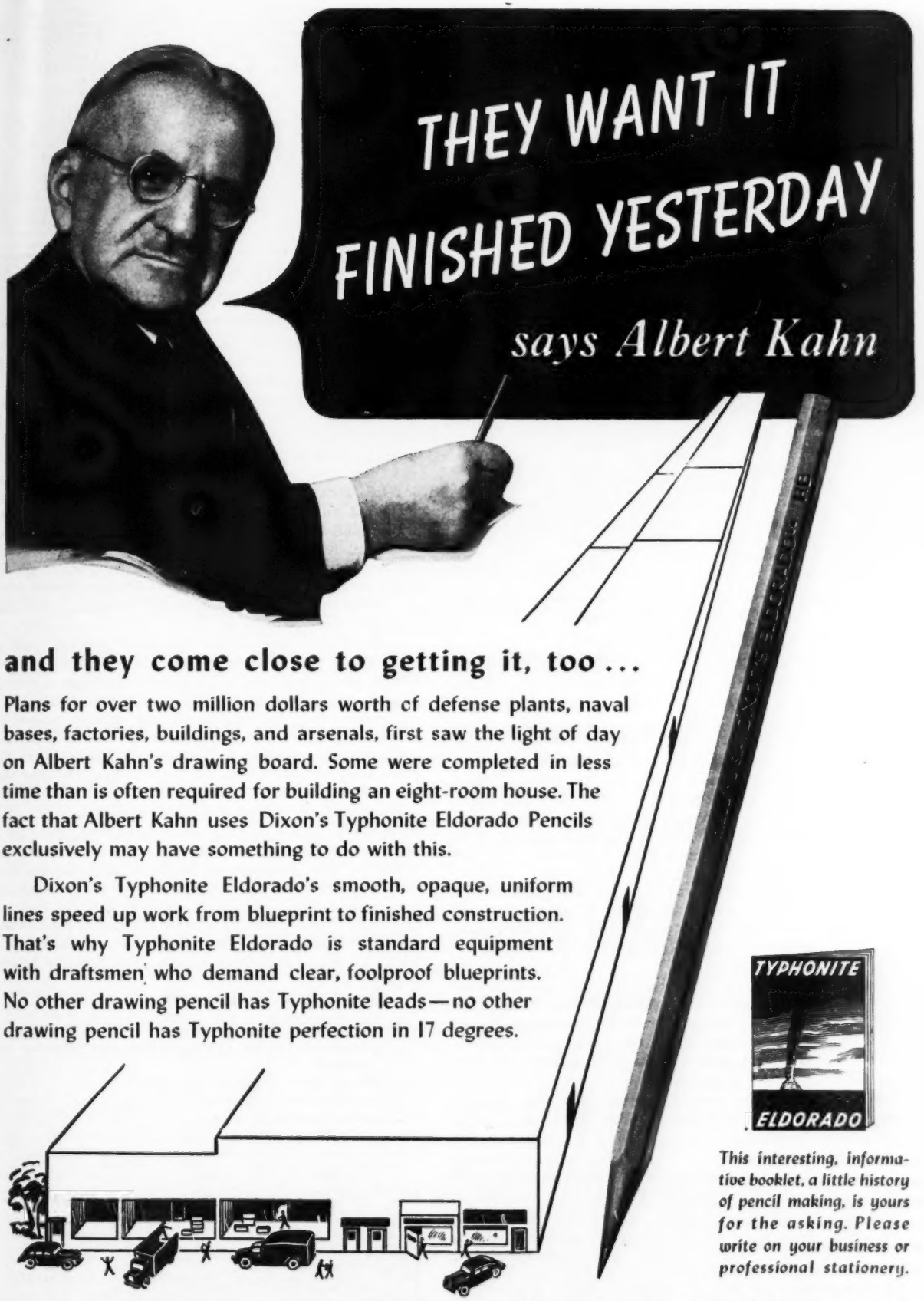
CONDITIONS: Contractor to furnish all materials other than required in the miscellaneous force account work. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.20 per hr.; semi-skilled, 90 to 75c.; and common, 62½c.

BIDS: Ten bids were opened October 22, 1941, ranging from the contract low of $173,579 to $284,760.

LIST OF BIDDERS:

1. Roy L. Bair, Spokane, Wash. (contract) $173,579
2. Henry Hagman, Cashmere, Wash. 180,825
3. Portland Bridge Co., Portland, Ore. 183,883
4. McLaughlin Constr. Co., Livingston, Mont. 189,972
5. Frank J. Haas, Great Falls, Mont. 194,854
6. W. P. Roscoe Co., Billings, Mont. 198,147
7. C. J. Montag & Sons Co., Portland, Ore. 202,695
8. Peter Kiewit Sons' Co., Omaha, Neb. 219,398
9. Thomas Staunton, Great Falls, Mont. 227,748
10. Nolan Bros., Inc., Minneapolis, Minn. 284,760

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Maintain existing road	L. S.	$300.00	$300.00	$300.00
2. Extra and misc. force account work	L. S.	1,500.00	1,500.00	1,500.00
3. Clearing	1.5 ac.	100.00	100.00	50.00
4. Grubbing	1 ac.	100.00	50.00	50.00
5. Unclassified excavation	600 c. y.	.40	1.00	.25
6. Uncl. excav. for pipe struct	50 c. y.	1.50	1.00	1.00
7. Uncl. excav. for bridge structures	2,800 c. y.	5.70	7.00	3.00
8. Uncl. excav. borrow	30,000 c. y.	.30	.27	.25
9. Special overhaul	28,000 sta. y.	.02	.02	.01
10. Roadside cleanup	1 ac.	100.00	100.00	50.00
11. Gravel base course	2,700 c. y.	1.50	1.40	1.10
12. Watering	120 M gal.	2.00	2.00	2.00
13. Provide and maintain water plants	L. S.	100.00	200.00	100.00
14. B-1 road mix surfacing laid	0.383 mi.	2,500.00	2,500.00	2,000.00
15. SC-3 grade asph. for Cl. B road mix	45 ton	35.00	40.00	30.00
16. RC-1 grade asph. for Cl. B seal	4 ton	60.00	65.00	40.00
17. Class A concrete	843 c. y.	24.50	24.00	40.00
18. Class B concrete	902 c. y.	24.50	23.00	15.00
19. Class D concrete	1,020 c. y.	24.50	23.00	40.00
20. Class S concrete	187 c. y.	24.50	23.00	15.00
21. Reinforcing steel	279,000 lb.	.065	.074	.08
22. Structural steel	2,500 lb.	.20	.20	.20
23. Structural steel (erected)	833,700 lb.	.025	.04	.03
24. Steel handrail	1,500 l. f.	6.40	6.00	9.50
25. 18-in. std. rein. conc. culv. pipe	85 l. f.	2.50	3.00	4.00
26. 18-in. corr. galv. sheet metal pipe	54 l. f.	2.00	3.50	4.00
27. 8-in. bit. coated corr. sheet metal pipe, type 2	140 l. f.	1.60	2.00	1.50
28. Untreated timber piling	4,900 l. f.	1.00	.60	.40
29. Treated timber piling	6,100 l. f.	1.80	1.00	.60
30. Hand laid rock embankment	25 c. y.	5.00	4.00	4.00
31. Concrete guide posts	80 ea.	4.00	4.00	5.00
32. Spillway inlet, bit. coat. corr. sheet metal pipe, type 2	4 ea.	40.00	40.00	30.00



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UNDERPASS, SOUTH CAROLINA

OWNER: South Carolina State Highway Dept., Columbia, S. C.; W. J. Gooding, chief bridge engineer.

PROJECT: Construction of treated timber, reinforced concrete and structural steel underpass under Seaboard Air Line RR. on Main Street, Darlington, S. C. Length approximately 101 ft.

CONDITIONS: Contractor to furnish all materials and complete work in 180 calendar days. Rail and highway transportation facilities available. Wage rates specified are: skilled labor, 55c. per hr.; semi-skilled, 35c.; and common, 30c.

BIDS: Six bids were opened January 21, 1941, ranging from the contract low of $27,186 to $37,589.

LIST OF BIDDERS:

1. Joseph W. Barnwell, Jr., Columbia, S. C. (contract) $27,186
2. F. A. Triplett, Chester, S. C. 29,263
3. Davis Moragne, Columbia, S. C. 30,305
4. C. Y. Thomason Co., Greenwood, S. C. 32,757
5. Vincennes Steel Corp., Vincennes, Ind. 34,777
6. M. L. Stephenson, Charleston, S. C. 37,589

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Wet and dry excav.; bridges	85 c. y.	$2.00	$2.00	$3.00
2. Cl. A cement concrete	139.5 c. y.	30.00	28.00	30.00
3. Reinforcing steel	13,818 lb.	.05	.05	.06
4. Untr. struct. timber	17.178 M bm.	40.00	60.00	80.00
5. Treat. struct. timber	8.972 M bm.	115.00	100.00	150.00
6. Steel superstr., incl. painting	L. S.	16,000.00	17,000.00	16,500.00
7. Untr. timber piling	850 l. f.	1.00	.70	1.00
8. Creosoted timber piling	1,980 l. f.	1.20	1.25	1.50
9. Supporting, rolling and lowering superstr.	L. S.	1,200.00	2,500.00	2,000.00

GRADE SEPARATION WASHINGTON, D. C.

OWNER: District Commissioners, District Building, Washington, D. C.

PROJECT: Constructing grade separation structures (overpass) in 14th Street, S.W., at Maine Avenue, Washington, D. C. Total length of main structure 1,570 ft. between end abutments and bridge structures at Maine Ave., the Outlet Channel and Hains Point Exit. Structures at Maine Ave. and Hains Point exit will be two span concrete rigid frames, the former 43 ft., and the latter 45½ ft. Outlet Channel bridge will consist of three span concrete rigid frame, each span 56-ft., and a three span continuous concrete girder ramp bridge. Various structures will be connected with stone faced concrete cellular construction. Entire superstructure, except concrete ramp girders, will be of reinforced concrete faced with stone masonry. Two vehicular roadways, 34-ft. each in width, to be separated by 4-ft. center curb.

CONDITIONS: Contractor to furnish all materials and complete work in 245 calendar days. Alternates were allowed on limestone and granite masonry for facing. Award made on former basis. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.50 to $2.00 per hr.; semi-skilled, 50 to 95c.; common, 85c.

BIDS: Five bids were received February 17, 1942, ranging from the contract low of $1,285,400 to $1,521,672. Engineer's estimate, $1,341,000.

LIST OF BIDDERS:

1. National Excavation & Structures Corp., New York $1,285,400
2. Charles H. Tompkins Co., Washington, D. C. 1,287,745
3. Stock Constr. Corp., New York, N. Y. 1,314,240
4. Lombardi Co., Inc., Philadelphia, Pa. 1,359,380
5. George Vang, Inc., Pittsburgh, Pa. 1,521,672

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Unclassified excavation	4,400 c. y.	$5.00	$8.00	$13.00
2. Remove old masonry and timber work	2,910 c. y.	33.00	20.00	22.00
3. Cast-in-place concrete piles	106,000 l. f.	3.00	3.15	2.70
4. Class BB concrete in footings	2,300 c. y.	24.00	17.00	27.00
5. Class BB concrete in neat work	3,130 c. y.	34.00	38.00	33.00
6. Class A concrete in neat work	5,600 c. y.	34.00	32.00	40.00
7. Class A concrete in roadway stringers	3,790 c. y.	34.00	36.00	40.00
8. Class A dressed limestone masonry	21,200 c. f.	5.00	4.00	3.40
9. Class A dressed granite masonry (Alt.)	21,200 c. f.	7.25	No bid	4.50
10. Class B rubble masonry	21,500 c. f.	2.50	2.20	1.90
11. Reinforcing steel	2,550,000 lb.	.06	.065	.08
12. Metal handrail	3,150 l. f.	5.00	8.00	6.00
13. Spec. cast iron curb drain inlets	6,800 lb.	.20	.20	.15
14. Misc. iron and steel, roadway dams	120,000 lb.	.20	.14	.12
15. Bronze bearing plates	3,160 lb.	1.00	1.00	.60
16. 6-in. pipe connecting drain to sewer	460 l. f.	2.00	2.50	2.00
17. 8-in. pipe connecting drain to sewer	1,600 l. f.	3.00	3.50	2.75
18. Damp-proofing, in place	440 s. y.	1.00	.50	.60
19. Two-arms standards, rdwy. lighting	18 ea.	120.00	200.00	200.00
20. Single-arm standards, No. 6211-Y102	2 ea.	100.00	100.00	150.00
21. Single-arm standards, No. 6211-Y157	4 ea.	125.00	100.00	125.00
22. Flush-type parapet luminaires	16 ea.	50.00	100.00	100.00
23. Lighting conduit in place	550 l. f.	3.00	1.50	2.00

STATE STREET BRIDGE, CHICAGO, ILL.

OWNER: City of Chicago, O. E. Hewitt, commissioner of public works; W. W. DeBerard, city engineer; Stephen Machuda, engineer of bridges.

PROJECT: Construction of new double-leaf bascule bridge over Chicago River on North State St., including north approach viaduct over C. & N.W. Ry. freight yards. Work divided into three general contracts: (1) foundations of bridge and viaduct; (2) superstructure of bridge and viaduct, including bascule operating equipment; (3) electrical equipment, including all motors, lighting, warning gates and signals, wiring and submarine cables. Foundations are all Chicago Well caissons, carried to rock 110 ft. below river level. Superstructure of main span is double-leaf bascule, 245 ft. c.c. trunnions, each leaf 108 ft. wide, of three trusses carrying two 41-ft. divided roadways and 13-ft. walks. Viaduct is steel frame with concrete deck.

CONDITIONS: Old bridge has been removed and new double-track State St. subway has been built under the river. Cofferdams on both shores for subway construction were left in place with provision for extending up and downstream for constructing main bridge piers. Bridge caissons close to subway were put down by subway contractor. River is navigable and must not be obstructed. Double-deck Wacker Drive along south bank of river affords highway access; rail and unimproved highway access available on north bank. Common labor rates $1.03, skilled from $1.63 to $2.00.

BIDS: Five bids were received on March 20, 1941, for the substructure, ranging from the contract price of $490,765 to $678,465. Bids were opened April 22, 1941, for the superstructure and electrical equipment. The five superstructure bids ran from $1,276,849 (contract) to $1,493,157. Four electrical bids were received, contract for $85,569 has been awarded to Fries Walters Co., Chicago. (Unit prices not shown here as contract is largely for lump sum items, list of bidders, however, is given).

Substructure

LIST OF BIDDERS:

1. FitzSimons & Connell Dredge & Dock Co., Chicago (contract) $490,765
2. MidWest Const. & Asphalt Co., Chicago 508,304
3. Great Lakes Dredge & Dock Co., Chicago 607,985
4. John C. Tully Co., Chicago 669,959
5. N. S. Mackie Co., Chicago 678,465

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove obstructions	L.S.	$6,000.00	$15,000.00	$15,000.00
2. Fences and sheds	L.S.	2,000.00	4,200.00	3,000.00
3. Cofferdams — Erec. river pier trusses	L.S.	140,000.00	156,000.00	207,745.00
4. North dock walls, excl. cement	L.S.	42,000.00	47,000.00	75,000.00
5. General excavation	5,700 c. y.	2.00	2.90	1.25
6. Dredging	17,000 c. y.	.45	.95	.75
7. Remove rock, boulders, masonry	600 c. y.	12.00	11.00	17.00
8. Remove pavements	400 s. y.	1.50	1.30	7.00
9. Std. portland cement	13,000 bbl.	2.50	2.20	2.15
10. Sub piers, excl. of cement	52,000 c. f.	1.30	1.30	1.15
11. Concrete, Class 1 (excl. cement)	6,000 c. y.	14.00	10.60	15.00

12. Sand fill and sand backfill	4,500 c. y.	1.00	.55	1.00
13. Permanent pile clumps	2 ea.	3,200.00	2,800.00	3,600.00
14. Other piles	2,500 l. f.	.35	.28	.45
15. Driving other piles	2,300 l. f.	.35	.38	.25
16. Creo. yellow pine or Douglas fir timbers	8 M bm.	170.00	125.00	250.00
17. Untr. yel. pine or Douglas fir timbers	25 M bm.	80.00	146.00	100.00
18. Concrete catch basins	3 ea.	175.00	108.00	200.00
19. Concrete sewer manholes	1 ea.	175.00	115.00	200.00
20. Granite block pavement	230 s. y.	8.00	3.80	4.00
21. Struct. steel and rubber bumpers	310,000 lb.	.0825	.0715	.08
22. Reinforcement metal	800,000 lb.	.045	.04	.05
23. 24-in. cast iron pipe sewer	3,500 lb.	.12	.054	.15
24. 8-in. cast iron pipe sewer	4,600 lb.	.15	.07	.20
25. Other cast iron	1,000 lb.	.12	.054	.10
26. Wrought iron	2,300 lb.	.40	.30	.50
27. Floor drains with traps	4 ea.	40.00	5.00	50.00
28. Safety treads	300 l. f.	2.00	.82	1.00
29. Steel sheet piling, left in cofferdams	70,000 lb.	.01	.0253	.03
30. Extra length st. sheet piling	25,000 lb.	.035	.029	.04
31. Sub piers — under air pressure	3,000 c. f.	.10	2.00	.35
32. High early strength cement	600 bbl.	3.50	2.60	4.00
33. Heating, ext. mixing of conc	3,000 c. y.	.25	.80	.25
34. Covering and heating conc	2,000 c. y.	.50	.70	.25
35. Mechanic's time	300 hr.	2.25	2.75	2.50
36. Laborer's time	300 hr.	1.50	1.75	1.50

Superstructure

LIST OF BIDDERS:

1. Overland Const. Co., Chicago (contract) $1,276,848
2. Ketler-Elliott Co., Chicago 1,296,283
3. Wm. J. Howard, Inc., Chicago 1,309,024
4. Mt. Vernon Bridge Co., Mt. Vernon, Ill. 1,432,207
5. FitzSimons & Connell Dredge & Dock Co., Chicago 1,493,157

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Fences, sheds and dock protection	L.S.	$3,116.00	$3,434.00	$2,000.00
2. Str. carbon steel and cast iron	4,400,000 lb.	.07892	.082	.0795
3. Struct. silicon steel	1,900,000 lb.	.0895	.091	.09169
4. Cast steel, excluding machinery	240,000 lb.	.239	.249	.248
5. Erect struct. and cast steel	6,540,000 lb.	.0207	.0201	.02279
6. Trans. hand placed salvaged c.i. counterweight	300 ton	10.05	9.07	8.00
7. Trans. hand placed salvaged comp. counterweight blocks	400 ton	8.55	6.25	10.00
8. 145-lb. conc. counterweight	2,600 ton	11.68	8.56	9.30
9. 275-lb. composition counterweight	430 ton	28.18	28.01	28.00
10. Standard portland cement	1,600 bbl.	2.54	3.08	2.30
11. High early strength cement	350 bbl.	3.37	3.84	2.85
12. Admixture No. 1	20,000 lb.	.079	.095	.075
13. Concrete, class 2	1,000 c. y.	36.18	34.41	32.50
14. Steel and conc. rdway.; movable leaves	1,770 s. y.	17.09	17.83	14.00
15. Conc. roadway wearing course	510 s. y.	3.12	3.01	1.90
16. Conc. sidewalk wearing course	480 s. y.	6.03	6.24	3.50
17. Reinforcement metal	105,000 lb.	.059	.064	.06
18. Curb protect., st. steel or cast iron	250 l. f.	2.02	2.00	2.00
19. Sidewalk safety treads	75 l. f.	8.70	7.00	7.95
20. Douglas fir and yellow pine; treated	29 M bm.	157.00	172.76	160.00
21. Redwood; untreated	15 M bm.	256.60	285.34	215.00
22. Asphaltic membrane waterproofing	1,600 s. y.	.82	.92	.80
23. ¾-in. asphalt planking	930 s. y.	2.00	2.12	2.00
24. Block pavement	1,200 s. y.	5.84	6.35	6.25
25. Rolled asphalt pavement	750 s. y.	3.11	3.56	5.65
26. Wacker Dr. sidewalk adjustment	L.S.	3,216.00	3,737.00	3,000.00
27. Remove masonry	5 c. y.	50.20	50.00	20.00
28. Machinery complete	L.S.	251,809.00	257,500.00	276,247.00
29. Electr. ducts and fittings	L.S.	1,392.00	1,414.00	1,571.00
30. Inst. and reconstruct drainage	L.S.	1,206.00	1,519.00	1,620.00
31. Oper. houses; encl. Wacker Dr. stairs; rail	L.S.	109,112.00	111,684.00	109,000.00
32. Plumbing installations	L.S.	1,709.00	1,767.00	2,208.00
33. Heating installations	L.S.	3,655.00	3,777.00	3,835.00
34. Furniture, lockers, equipment	L.S.	352.00	400.00	320.00
35. Hand railing and trap doors	L.S.	19,698.00	20,220.00	20,288.00
36. Field painting; except houses	L.S.	12,060.00	12,120.00	12,269.00
37. Untr. yel. pine or Doug. fir	10 M bm.	122.10	128.50	110.00
38. Wrought iron or Toncan iron	1,000 lb.	.25	.28	.10
39. Common brick	5 M	50.00	52.00	52.00
40. Face brick	2 M	80.00	78.00	97.00
41. Enamel brick	2 M	100.00	160.00	135.00
42. Cut stone	100 c. f.	4.00	4.25	4.00
43. Pre-heating and ext. mixing of concrete	400 c. y.	1.00	1.05	2.00
44. Covering and heating concrete in place	400 c. y.	.50	.60	2.00
45. Mechanic's time	200 hr.	3.15	3.00	3.00
46. Laborer's time	300 hr.	2.00	2.00	2.00

Electrical Work

LIST OF BIDDERS:

1. Fries Walters Co., Chicago (contract) $85,569
2. Harmon Electric Co., Chicago 88,088
3. Divane Brothers, Chicago 88,952
4. Garden City Engineering Co., Chicago 91,154

UNDERPASS AND APPROACHES NEW MEXICO

OWNER: New Mexico State Highway Department, Santa Fe; J. P. Church, Roswell, N. M., district engineer.

PROJECT: Construction underpass and approaches in DeBaca County, N. M., on U. S. Highway 60 between Fort Sumner and Clovis. Approximate length of underpass is 0.568 miles, and approach and roadway length is 2.839 miles. Involves all grading, minor drainage structures, base surfacing and concrete and steel railroad underpass.

CONDITIONS: Contractor to furnish all material and complete work in 250 weather working days. Rail and highway transportation facilities available. Wage rates specified as minimums are: skilled labor, 80c. to $1.50; semi-skilled, 60 to 80c.; and common, 45 to 55c.

BIDS: Four bids were opened September 5, 1941, ranging from the contract low of $99,809 to $124,785. Alternate was allowed of standard reinforced concrete culvert pipe or corrugated galvanized metal culvert pipe. Contract awarded on basis of latter.

LIST OF BIDDERS:

1. Henry Thygesen & Co., Albuquerque, N. M. (contract) $99,809
2. Davies & Sons, Albuquerque, N. M. 112,193
3. Cook & Ransom, Ottawa, Kan. 116,463
4. W. E. Bondurant, Roswell, N. M. 124,784

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old drainage structures	L. S.	$10.00	$100.00	$10.00
2. Excavation, unclassified	107,000 c. y.	.16	.15	.275
3. Overhaul	165,000 sta. y.	.01	.03	.01
4. Haul	95,000 ¼-mi. y.	.03	.08	.04
5. Rolling	1,075 hr.	4.00	6.00	4.00
6. Base crse. surfacing, No. 1 aggregate	17,300 ton	.75	.70	.80
7. Base crse. surfacing, No. 2 aggregate	18,500 ton	.65	.60	.60
8. Cl. A conc.; curb, gutter, rundowns	36 c. y.	20.00	20.00	17.00
9. Watering	1,730 M gal.	1.50	2.00	1.50
10. Cl. A concrete, box culverts	173 c. y.	19.00	20.00	17.00
11. Reinforcing steel	21,800 lb.	.08	.07	.09
12. Structural steel	282,000 lb.	.08	.09	.10
13. 6-in. perf. corr. galv. met. culv. pipe	68 l. f.	1.00	2.00	1.00
14. Gate and cattleguard, 9-ft. roadway	4 ea.	400.00	600.00	300.00
15. Rein. conc. monument and marker	4 ea.	40.00	25.00	25.00
16. Galv. barbed wire fence	19,500 l. f.	.07	.10	.10
17. Gates, Texas type	5 ea.	5.00	10.00	5.00
18. Bracing	60 ea.	2.00	3.00	3.00
19. Rt.-of-way station markers	30 ea.	4.00	4.00	2.50
20. Remove and rebuild fence	10,000 l. f.	.04	.05	.05
21. Obliterating old road	0.4 mi.	50.00	100.00	100.00
22. Contour ditches	8,200 l. f.	.05	.10	.10
23. Railroad structure concrete	376 c. y.	23.00	20.00	17.00
24. Intermed. grade reinf. steel	25,000 lb.	.08	.07	.09
25. Membrane waterproofing	50 s. y.	3.00	2.00	2.25
26. Screened gravel fill	50 c. y.	2.00	4.00	2.00
27. Mechanical tamping	317 hr.	3.00	5.00	1.50
28. 24-in. corr. galv. met. culv. pipe	356 l. f.	3.00	3.00	3.00
29. 30-in. corr. galv. met. culv. pipe	192 l. f.	4.00	4.00	3.50
30. 24-in. rein. conc. culv. pipe (Alternate, Item 28)	356 l. f.	3.50	3.00	3.50
31. 30-in. rein. conc. culv. pipe (Alternate, Item 29)	192 l. f.	4.50	4.00	4.00

BRIDGE, KENTUCKY

OWNER: Kentucky State Highway Dept., Frankfort, Ky.; H. E. Rudy, resident engineer, West Point, Ky.

PROJECT: Construction of substructure and superstructure of highway bridge over Salt River, at West Point, Ky., near Fort Knox, on the Louisville-Elizabethtown Road. Approximate length, 0.166 miles. Superstructure consists of four 100-ft. plate girder spans, and one 470½-ft. continuous plate girder unit. Roadway 48-ft. wide; two sidewalks, 2½-ft. wide.

CONDITIONS: Contractor to furnish all materials and complete substructure work in 180 days. Rail, water and highway transportation facilities available. Bridge to be located near Fort Knox, and will be required to carry armored cars and other mechanical equipment stationed there. Wage rates are: skilled labor, $1.12½ to $1.50 per hr.; semi-skilled, 75c. to $1.25; and common, 60c. per hr.

BIDS: Three bids were opened on the substructure April 11, 1941, ranging from the contract low of $279,873 to $331,595. Three bids were received on the superstructure April 25, 1941, ranging from the contract low of $384,375 to $421,646.

Substructure

LIST OF BIDDERS:

1. Ryan Constr. Corp., Evansville, Ind. (contract) $279,873
2. L. G. Arnold, Inc., Eau Claire, Wis. 284,513
3. Charles E. Cannel Co., Inc., Louisville, Ky. 331,595

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Class A concrete	4,883.1 c. y.	$17.10	$19.50	$20.00
2. Reinforcing steel	719,450 lb.	.047	.05	.05
3. 12-in. steel piles	23,150 l. f.	2.50	2.20	2.75
4. 14-in. concrete piles	11,650 l. f.	2.50	3.20	3.00
5. Struct. excav., common, Item 1	4,780 c. y.	13.30	10.50	20.00
6. Struct. excav., common, Item 2	2,960 c. y.	4.00	5.00	1.25
7. Wrought iron steps	48 ea.	3.00	2.50	1.00

Superstructure

LIST OF BIDDERS:

1. Mt. Vernon Bridge Co., Mt. Vernon, Ohio (contract) .. $384,375
2. Bethlehem Steel Co., Bethlehem, Pa. 410,493
3. American Bridge Co., Cincinnati, Ohio 421,646

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Structural steel	3,543,340 lb.	$0.084	$0.085	$0.084
2. Lead plates	2,150 lb.	.15	.11	.15
3. Class A concrete	1,361.8 c. y.	30.00	31.00	36.00
4. Class D concrete	86.2 c. y.	40.00	81.00	73.00
5. Reinforcement steel	275,170 lb.	.06	.055	.061
6. Creosoted timber	8 M bm.	200.00	130.00	260.00
7. Remove exist. structures	L. S.	24,000.00	43,700.00	49,500.00

BRIDGE, PENNSYLVANIA

OWNER: Pennsylvania Dept. of Highways, Harrisburg.

PROJECT: Construction of steel deck cantilever bridge, and reinforced concrete paving 1,515 feet of Legislative Route 187, Section 6-B, Wilkins and Patton Townships, Allegheny County, Pa. Pavement width 30-ft. Bridge to be constructed over railroad tracks.

CONDITIONS: Contractor to furnish all materials and complete work in 380 calendar days. Rail and highway transportation facilities available. Involves great deal of superstructure work, little concrete needed. Wage rates are: skilled labor, $1.00 per hr.; semi-skilled, 60c.; and common, 50c.

BIDS: Eight bids were opened April 4, 1941, ranging from the contract low of $548,855 to $685,057.

LIST OF BIDDERS:

1. Dinardo, Inc., Pittsburgh, Pa. (contract) $548,855
2. Harrison Constr. Co., Pittsburgh, Pa. 555,895
3. Frank & Kukurin, Wilmerding, Pa. 578,649

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	L.S	$2,000.00	$2,000.00	$300.00
2. Class I excavation	5,080 c. y.	.75	.60	.70
3. Class II excavation	3,585 c. y.	2.50	3.00	4.00
4. Borrow excavation	9,802 c. y.	.75	.50	.50
5. Subgrade	990 s. y.	.20	.15	.20
6. Shoulders	270 l. f.	.20	.30	.30
7. 9-in. rein. cem. conc. pavmt.	990 s. y.	3.50	3.30	3.00
8. Rein. cem. conc. wearing surf., br. floor	703 s. y.	1.50	2.50	2.50
9. Class A. concrete	496 c. y.	32.00	42.00	30.00
10. Class B concrete	1,974 c. y.	30.00	24.00	22.00
11. Plain steel bars	228,180 lb.	.05	.05	.05
12. Plain structural steel	271,000 lb.	.063	.068	.07
13. Fabricated struct. steel	3,835,000 lb.	.0845	.0875	.09
14. Stone backfill, structures	10 c. y.	18.00	3.50	5.00
15. Type F. inlet	1 ea.	100.00	100.00	100.00
16. 15-in. rein. cem. conc. pipe	102 l. f.	3.00	3.00	3.00
17. 4-in. tile underdrain	606 l. f.	.90	.75	1.00
18. Tile foundation underdrain, type B, 4-in.	40 l. f.	.75	.70	.80
19. 4-in. tile outlets	100 l. f.	.75	.70	.80
20. Metal railing	2,414 l. f.	7.65	8.00	8.00
21. Steel beam bridge flooring	42,230 s. f.	1.17	1.20	1.40
22. 10-ft. diam. foundation columns	393 l. f.	60.00	60.00	90.00
23. Treated lumber	9 M bm.	130.00	150.00	140.00
24. Fl. cem conc. curbing, type A	62 l. f.	2.00	1.50	2.00
25. Plain cement conc. sidewalks	10 s. y.	3.50	3.00	4.00
26. Type 1-A, 2-A, 3-A, or 4-A guard fence	144 l. f.	1.00	1.00	1.00
27. Type 1-B, 2-B, 3-B or 4-B guard fence	112 l. f.	1.00	.90	1.00
28. Type 1, 2, 3 or 4 end anchorages	2 ea.	25.00	25.00	25.00

WATER MAINS, MICHIGAN

OWNER: Warren Township, Macomb County, Mich., and Defense Public Works Division of the FWA.

PROJECT: Construction of 34,860 feet of cast iron water mains in Warren Township, Macomb County, Michigan. Pipe sizes range from 6-in. to 16-in., and average depth of pipe-laying 6 ft. No hard materials expected to be encountered in trenching. (Contract 5.)

CONDITIONS: Contractor to furnish all materials and complete work within 90 days after notice to proceed. Rail and highway transportation facilities available. Traffic congestion in vicinity of new defense plant may impede construction at times. Project was divided into several contracts, of which this is one, to enable smaller contractors to bid the work, and to obtain better range of competitive bids. Wage rates are: skilled labor, $1.625 per hr.; semi-skilled, $1.25; and common, 87½c.

BIDS: Twelve bids were opened January 27, 1942, ranging from the contract low of $129,103 to $149,427.

LOW BIDDERS:

1. Fattore Co., Detroit, Mich. (contract) $129,103
2. Waterway Constr. Co., Detroit, Mich. 135,713
3. Santucci Constr. Co., Skokie, Ill. 136,821

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 16-in. cast iron water mains	7,515 l.f.	$4.88	$5.25	$5.40
2. 12-in. cast iron water mains	14,965 l.f.	3.27	3.38	3.39
3. 8-in. cast iron water mains	9,300 l.f.	2.15	2.24	2.11
4. 6-in. cast iron water mains	3,080 l.f.	1.75	1.60	1.64
5. Hydrants, gates and boxes	46 ea.	160.00	176.00	189.00
6. 16-in. gates and wells	7 ea.	350.00	370.00	355.00
7. 12-in. gates and wells	18 ea.	180.00	197.00	210.00
8. 8-in. gates and wells	27 ea.	132.00	148.00	155.00
9. 6-in. gates and wells	13 ea.	115.00	130.00	130.00

WATER SUPPLY SYSTEM LAS VEGAS, NEVADA

OWNER: U. S. Engineer Office, Los Angeles, Calif.

PROJECT: Construction of water supply system at Las Vegas Airport, approximately 8 miles northeast of Las Vegas, Nev. Involves building of valve house at site of existing artesian well, approximately 5 miles of gravity flow pipe line, and pumping plant, including ground storage tank and appurtenant facilities. Work includes following principal items: excavation, filling and grading; concrete; pipe laying; furnishing and installing pumping equipment and steel water storage tank; electrical work; painting; and cleaning-up.

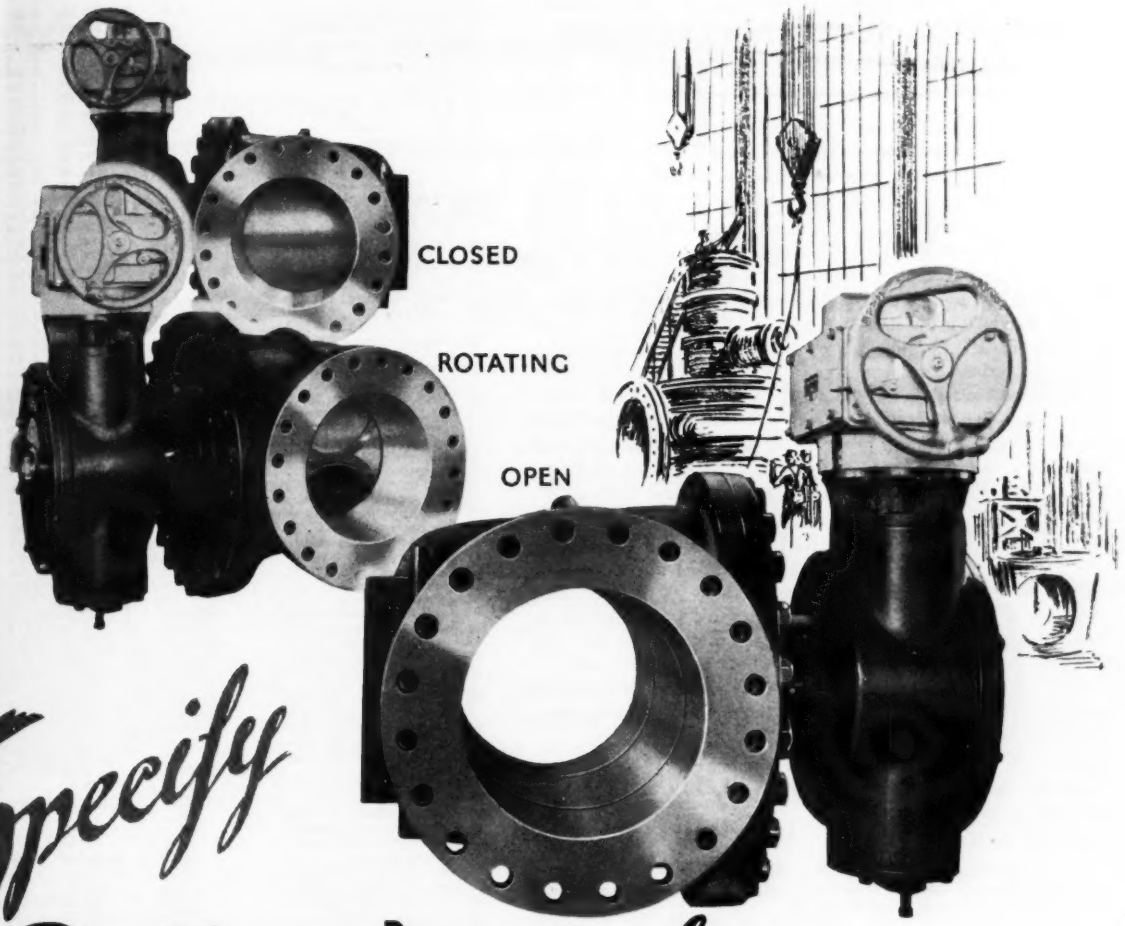
CONDITIONS: Contractor to furnish all materials and complete work in 70 days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 90c. to $1.50 per hr.; semi-skilled, 62½c. to $1.00; and common labor, 62½c.

BIDS: Five bids were opened May 19, 1941, ranging from the contract low of $99,905 to $123,629.

LIST OF BIDDERS:

1. Vinson & Pringle, Phoenix, Ariz. (contract) $99,905
2. H. B. Nicholson, Los Angeles, Calif. 103,570
3. Fritz Ziebarth, Long Beach, Calif. 104,637
4. Charles J. Dorfman, Los Angeles, Calif. 107,546
5. R. A. Wattson Co., and Gogo & Rados, Los Angeles, Calif. 123,629

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Pump house and appurtenances	L. S.	$34,642.24	$37,466.00	$38,378.00
2. Valve pit at Well No. 2	L. S.	664.85	675.00	700.00
3. 10-in. gravity supply line	27,680 l. f.	2.28	2.30	2.30
4. 10-in. gave valves in supply line	3 ea.	117.30	150.00	135.00
5. Air and vacuum valves and manholes on supply line	9 ea.	79.58	60.00	90.00
6. 6-in. blow-off connection	1 ea.	246.87	275.00	380.00
7. 15-in. corr. met. pipe sleeve	50 l. f.	3.45	10.00	6.00



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FILTRATION PLANT, TRANSMISSION MAINS, NEWPORT NEWS, VA.

OWNER: Newport News Waterworks Commission, Newport News, Va., in conjunction Defense Public Works, Federal Works Agency, Reeves Newsom, Newsom & Aldrich, consulting engineer.

PROJECT: Construction of filtration plant, 6,000,000 gallon-per-day capacity, at Harwood's Mill in York County, Va., and transmission mains from plant to Newport News and Hampton. Includes about 42,600 feet of 30-in. cast iron pipe; 24,000 ft. of 20-in. cast iron pipe; 15,300 ft. 16-in. pipe, and 6,000 ft. of 12-in. pipe; all excavation; concrete and brick masonry; valves and appurtenances; superstructures; filter equipment; pumping equipment; and appurtenant work. Project has priority rating of A-3, and was first of the DPW projects to be set up and progress through various branches of the Federal Works Agency and through the Division of Priorities of the OPM. City received $803,600 allotment from DPW.

CONDITIONS: Contractor to furnish all materials and complete work by May 15, 1942. Rail, highway and transportation facilities available. Minimum wage rates approved are: skilled labor, $1.00 to $1.50; semi-skilled, 50 to 75c.; and common labor, 40 to 50c. per hr. Alternates were allowed on the 30-in. pipe, either concrete or cast iron; lower bid was for cast iron pipe. Another alternate which permitted construction of a wash water standpipe, or a wash water elevated tank with the cathodic or electrolytic method of protection, found the former to be lower.

BIDS: Six bids were received November 5, 1941, ranging from the contract low of $988,689 to $1,210,955. Engineer's estimate, $1,060,420.

LIST OF BIDDERS:

(Based on 30-in. c.i. pipe and wash water standpipe).

1. Bass Engr. & Constr. Co., Detroit, Mich. (contract) $988,689
2. Tuller Constr. Co., Red Bank, N. J. 1,030,370
3. A. H. Guion & Co., Inc., Charlotte, N. C. 1,040,075
4. Virginia Engr. Co., Newport News, Va. 1,079,492
5. John Felmley Co., Bloomington, Ill. 1,091,705
6. Woodcrest & Rosoff Bros. Constr. Co., New York, N. Y. 1,210,955

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation and disposal	15,000 c. y.	$2.50	$3.00	$1.45
2. Timber piles	500 l. f.	2.50	.80	1.50
3. Concrete (fndn. and gr. floor)	650 c. y.	35.00	30.00	17.70
4. Concrete (walls)	1,250 c. y.	35.00	36.00	30.00
5. Concrete (slabs, beams, etc.)	600 c. y.	35.00	38.00	35.00
6. Concrete (not reinforced)	100 c. y.	30.00	18.00	17.00
7. Steel reinforcement	130,000 lb.	.07	.10	.06
8. Cast iron pipe, h. & s	175 ton	88.00	120.00	105.00
9. Cast iron specials, h. & s	35 ton	250.00	210.00	220.00
10. Cast iron specials, flanged	40 ton	300.00	260.00	275.00
11. 24-in. gate, flanged end, hydraul. cylind.	4 ea.	625.00	800.00	750.00
12. 24-in. gate, fl. end., hydr. cyl. special	4 ea.	750.00	800.00	900.00
13. 20-in. gate valve, hub end, with box	1 ea.	250.00	300.00	258.00
14. 16-in. gate valve, fl. end, hyd. cyl.	4 ea.	275.00	325.00	325.00
15. 16-in. gate, hub end, bevel gear, with box	3 ea.	300.00	350.00	314.00
16. 12-in. gate, fl. end, hyd. cyl.	4 ea.	200.00	200.00	200.00
17. 12-in. gate, fl. end, with wheel	2 ea.	90.00	100.00	92.00
18. 12-in. gate, hub end, with box	3 ea.	90.00	100.00	83.00
19. 12-in. gate, hub end, with box	1 ea.	120.00	125.00	117.00
20. 10-in. gate, fl. end, with wheel	1 ea.	75.00	80.00	75.00
21. 8-in. gate, hub end, with box	1 ea.	50.00	60.00	52.00
22. 6-in. gate, fl. end, with wheel	6 ea.	40.00	45.00	48.00
23. 6-in. gate, hub end, with box	2 ea.	45.00	45.00	39.00
24. 4-in. gate, fl. end, with wheel	5 ea.	25.00	30.00	33.00
25. 4-in. gate, fl. end, with wheel	2 ea.	22.00	25.00	27.00
26. 24-in. check valve, hub end	1 ea.	800.00	800.00	850.00
27. 12-in. check valve, fl. end	2 ea.	225.00	250.00	308.00
28. 10-in. check valve, fl. end	1 ea.	175.00	170.00	250.00
29. 4-in. check valve, fl. end	2 ea.	50.00	60.00	92.00
30. 10-in. cone valve, fl. end	1 ea.	2,000.00	1,600.00	1,672.00
31. 8-in. cone valve, fl. end	2 ea.	1,350.00	1,400.00	1,370.00
32. 16-in. sluice gate, fl. end., with stand.	7 ea.	250.00	400.00	219.00
33. 12-in. pressure relief valve, fl. end.	1 ea.	900.00	1,000.00	1,095.00
34. 20-in. float valve, fl. end	1 ea.	1,000.00	2,000.00	2,185.00
35. 6-in. flap valve, fl. end	4 ea.	20.00	25.00	38.00
36. 4-in. plug valve, spigot end	1 ea.	40.00	65.00	46.00
37. 6-in. soil pipe drain and sewer	100 l. f.	2.50	.80	1.00
38. 6-in. vitr. tile, open joints	500 l. f.	.75	.60	1.00
39. 6-in. vitr. tile sewer and drain	300 l. f.	.50	.50	.60
40. Intake bulkhead	L. S.	1,000.00	500.00	450.00
41. Intake water screen	L. S.	4,500.00	5,000.00	4,306.00
42. Aerator tower	L. S.	3,500.00	6,000.00	5,200.00
43. Flocculators	L. S.	3,500.00	4,500.00	3,644.00
44. Filter underdrainage system	4 ea.	2,000.00	3,000.00	2,578.00
45. Filter gravel	120 c. y.	10.50	12.00	17.00
46. Filter sand	200 c. y.	10.00	9.00	13.00
47. Wash water gutters	4 ea.	900.00	2,500.00	2,163.00
48. Operating tables	4 ea.	700.00	1,100.00	1,118.00
49. Sample table	1 ea.	700.00	1,000.00	1,050.00
50. Controllers and gages	4 units	2,000.00	3,000.00	2,670.00
51. Water level gages	L. S.	1,250.00	2,600.00	1,922.00
52. Telemeter gage	L. S.	225.00	300.00	709.00
53. 24-in. discharge meter	1 ea.	1,750.00	1,800.00	2,321.00
54. 24-in. wash water meter	1 ea.	1,750.00	1,900.00	2,384.00
55. 6-in. meters	L. S.	800.00	500.00	1,218.00
56. Dry feed machine	L. S.	2,000.00	4,000.00	4,080.00
57. Chlorinators and ammoniators	L. S.	5,500.00	8,000.00	7,256.00
58. Superstructure	L. S.	27,100.00	33,000.00	35,000.00
59. Heating and ventilating	L. S.	5,000.00	7,500.00	8,850.00
60. Electric lighting	L. S.	14,500.00	18,000.00	9,165.00
61. Plumbing	L. S.	2,500.00	2,000.00	1,900.00
62. Pump, 2,200 gpm., 30-ft. head	1 ea.	800.00	1,100.00	939.00
63. Pump, 2,900 gpm., 30-ft. head	1 ea.	1,100.00	1,400.00	1,222.00
64. Pump, 4,400 gpm., 30-ft. head	1 ea.	1,750.00	2,300.00	2,026.00
65. Pump, 2,100 gpm., 190-ft. head	1 ea.	2,200.00	2,800.00	2,592.00
66. Pump, 2,800 gpm., 200-ft. head	1 ea.	2,600.00	3,400.00	3,083.00
67. Pump, 4,200 gpm., 205-ft. head	1 ea.	3,600.00	4,200.00	4,167.00
68. Pump, 400 gpm., 60-ft. head	2 ea.	410.00	500.00	485.00
69. Wet vacuum pump	L. S.	430.00	550.00	335.00
70. High pressure pump	L. S.	650.00	750.00	460.00
71. Switchboard and equipment	L. S.	15,000.00	25,000.00	21,148.00
72. Misc. cast iron, wr. iron and steel	L. S.	2,100.00	4,000.00	4,485.00
73. Railings	L. S.	2,800.00	3,500.00	3,322.00
74. Flush hydrant	2 ea.	60.00	110.00	117.00
75. Fire hydrant	1 ea.	100.00	125.00	126.00
76. Wash water standpipe	L. S.	5,995.00	7,500.00	6,050.00
77. Wash water elev. tank (alternate)	L. S.	7,660.00	9,500.00	8,040.00
78. Cathodic protection (alternate)	L. S.	340.00	400.00	400.00
79. Laboratory equipment	L. S.	2,500.00	2,500.00	2,500.00
80. Miscellaneous equipment	L. S.	500.00	500.00	500.00
81. Manholes and catch basins	L. S.	1,000.00	2,000.00	890.00
82. Roads and walks	L. S.	760.00	1,000.00	1,350.00
83. Grassing and seeding	L. S.	600.00	1,500.00	500.00
84. Operators residence	3 ea.	4,250.00	6,000.00	4,200.00
85. Furnish 30-in. cast iron pipe	42,500 l. f.	7.25	6.78	6.88
86. Furnish 20-in. cast iron pipe	23,900 l. f.	4.75	4.42	4.50
87. Furnish 16-in. cast iron pipe	15,200 l. f.	3.50	3.20	3.21
88. Furnish 12-in. cast iron pipe	5,900 l. f.	2.25	2.10	2.10
89. Furnish 30-in. cast iron specials	50 ton	130.00	125.00	137.00
90. Furn. 24-in. and under c. i. spec.	50 ton	110.00	120.00	115.00
91. Laying 30-in. cast iron pipe	42,600 l. f.	1.25	1.40	2.40
92. Laying 20-in. cast iron pipe	24,000 l. f.	1.10	1.00	1.87
93. Laying 16-in. cast iron pipe	15,300 l. f.	1.00	.87	1.38
94. Laying 12-in. cast iron pipe	6,000 l. f.	.90	.88	1.00
95. Furn. and laying 30-in. concrete pipe (alternate)	42,600 l. f.	8.64	8.25	9.00
96. Rock excavation	100 c. y.	10.00	.01	3.00
97. Excess depth excavation	500 c. y.	.50	.25	1.50
98. Replace macadam pavement	500 s. y.	1.50	2.00	2.00
99. Replace concrete pavement	200 s. y.	3.00	5.00	5.00
100. Replace concrete sidewalks	100 s. y.	1.50	2.00	2.00
101. Railroad crossings	L. S.	3,500.00	1,500.00	750.00
102. Conc. pile supports (benta)	100 ea.	135.00	130.00	130.00
103. 20-in. gates and chambers	18 ea.	500.00	475.00	560.00
104. 16-in. gates and chambers	6 ea.	400.00	350.00	430.00
105. 12-in. gates and boxes	6 ea.	120.00	98.00	130.00
106. 8-in. gates and boxes	12 ea.	60.00	46.00	60.00
107. 6-in. gates and boxes	30 ea.	40.00	32.00	40.00

WATER SUPPLY DAM WEST VIRGINIA

OWNER: Beckley Water Co., Beckley, W. Va.; W. D. Kelley, engineer.

PROJECT: Construction of a concrete gravity type dam on Glade Creek, in Raleigh County, West Virginia, for water supply. Height 35 ft.; length 360 ft.

CONDITIONS: Owner to furnish sluice gate, trash racks, screens, piping, fittings and valves, contractor to furnish balance of material and complete work in six months. Rail and highway transportation facilities available. Approximately 15 percent Cyclopean stone permitted. Local sandstone suitable for Cyclopean stone and coarse aggregate. Low bidder, however is considering importing all aggregate by rail, with 7½-mile haul over improved highway from railhead to dam site. Common labor rate on project ranges from 40 to 45c. per hr.

BIDS: Ten bids were opened February 14, 1941, ranging from the low of $105,870 to $142,760. Engineer's estimate, $113,200.

LIST OF BIDDERS:

1. C. C. Dodd Constr. Co., Spencer, W. Va. $105,870
2. Vecellio & Grogan, Beckley, W. Va. 109,050
3. Pocahontas Constr. Co., Lewisburg, W. Va. 109,332
4. Janutolo & Co., Fayetteville, W. Va. 116,615
5. McDowall & Wood, Roanoke, Va. 117,670
6. Geo. H. Siems & Co., Mt. Hope, W. Va. 119,376
7. W. A. Wilson & Co., St. Marys, W. Va. 124,720
8. Price Constr. Co., Huntington, W. Va. 127,470

BY... *providing trouble-free service*
... performing efficiently
... reducing operating costs

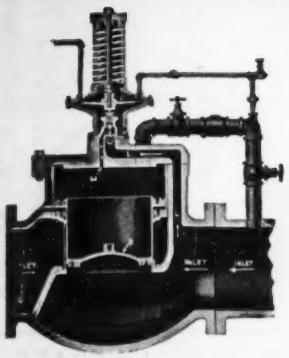
... G-A VALVES ARE BOTH *SERVING* AND *SAVING* ON WATER LINES AND STORAGE TANKS ALL OVER THE COUNTRY!!

The most prominent of GOLDEN-ANDERSON Valves' SAVING and SERVING characteristics come to light upon checking the countless G-A installations on storage tanks and water lines in every part of the country. On each of these installations, G-A Valves are providing the performance so vital under today's stepped-up conditions.

First, they are giving long-lived, trouble-free service . . . . definitely a SAVING feature through less maintenance and fewer purchases of costly replacement parts.

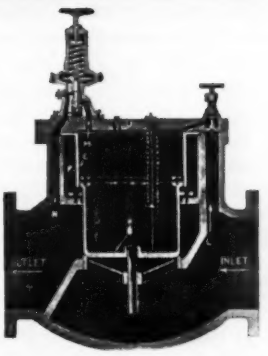
Second, G-A Valves' efficient performance on every installation is a SERVICE feature . . . . dependable, every-ready operation stamps the scientifically designed and built product. Finally, G-A is reducing all-over operating expense . . . . a SAVING feature, and most important with rising costs cutting into profit percentages. In short, GOLDEN-ANDERSON Valves represent "more years of *saving service* per valve dollar expended".

Check with GOLDEN-ANDERSON regarding "on-the-job" valve servicing and valve maintenance data. Valve breakdowns and service delays on vital lines and tanks are "out" for the duration, so be prepared to meet emergencies with up-to-the-minute information on all types of G-A specialty valves. Write for it today!



ALTITUDE CONTROL VALVE

Maintains water levels within 3 to 12 in. variation. Differential control permits delayed valve opening for any depth tank. May be fitted for electric control or remote operations. Single or double acting. 2 to 36 in. sizes.



WATER REDUCING VALVE

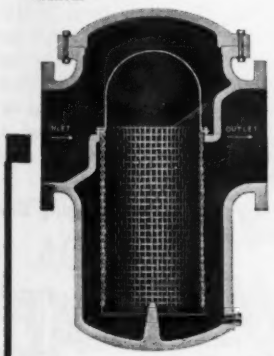
Gives constant terminal-delivery pressure under varying demands. No shock or jar upon adjustment. No metal contacts. Sizes ½ to 36 inches.

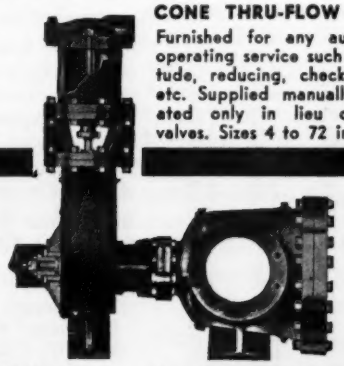
CONTROLLED FLOAT VALVE

Maintains water level within 1" variation. Suitable for closed or open tanks, etc. Furnished without self contained float ball chamber, if desired. Air and water cushioned.

WATER STRAINER

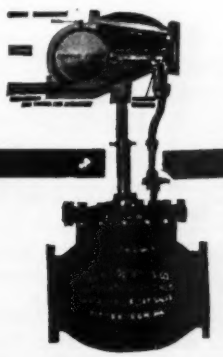
Comes with large capacity basket of suitable mesh to meet all service demands. Readily cleaned. Sizes 3 to 36 inches.





CONE THRU-FLOW VALVE

Furnished for any automatic operating service such as altitude, reducing, check, relief, etc. Supplied manually operated only in lieu of gate valves. Sizes 4 to 72 inches.



GOLDEN-ANDERSON

★ VALVE SPECIALTY COMPANY ★

1300 FULTON BLDG. **PITTSBURGH, PA.**

9. F. L. Showalter, Lynchburg, Va. 135,230
10. Monty Bros., Charleston, W. Va., and Oscar Vecellio, Itman, W. Va. 142,760

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Diversion and care of stream	L.S.	$1,000.00	$1,000.00	$1,000.00
2. Clearing dam site	L.S.	500.00	75.00	200.00
3. Excavation, general	13,500 c. y.	.60	.65	.55
4. Excavation, rock	1,500 c. y.	1.50	5.00	2.10
5. Overhaul	10,000 sta. y.	.04	.01	.05
6. Backfill, tamped or puddled	1,000 c. y.	.70	.20	.65
7. Test drilling	400 l. f.	1.00	.40	1.00
8. Foundation grouting	200 bag	1.00	2.00	4.00
9. Class A concrete	200 c. y.	16.00	13.00	14.54
10. Class B concrete	7,300 c. y.	12.00	11.90	12.40
11. Reinforcing steel	8,000 lb.	.05	.06	.05
12. Copper water stops	500 ll. f.	.60	.70	.65
13. Handrail, single rail	160 . f.	2.00	1.50	2.00
14. Handrail, double rail	160 l. f.	3.00	2.50	4.00
15. Install pipe fittings, valves, etc.	L.S.	500.00	300.00	500.00

SAN VICENTE DAM, SAN DIEGO, CALIF.

OWNER: Water Department, City of San Diego, Calif.; Fred D. Pyle, hydraulic engineer.

PROJECT: Construction of San Vicente Dam, a solid masonry structure located on San Vicente Creek, about four miles north of Lakeside, Calif. Top length 950 ft.; height from stream bed 190 ft. Involves about 85,000 cu. yd. of excavation of all classes; 300,000 cu. yd. of concrete; and about 175,000 lb. of reinforcing steel. Dam is straight structure, with spillway in center and is to provide reservoir for San Diego water supply.

CONDITIONS: Contractor to provide all materials except cement, cast iron and steel pipe which are to be furnished under another contract. Work to be completed in 730 calendar days. Rail transportation facilities available to Lakeside, from whence paved highway passes through dam site. Sand is available in unlimited quantities in stream bed near work. Probability that all coarse aggregate can be obtained within reservoir basin and surrounding mountains. Wage rates prevailing are: skilled labor, $9.00 to $12.00 per 8-hour day; semi-skilled, $6.00 to $8.00; and common, $6.00.

BIDS: Four bids were opened August 26, 1941, ranging from the contract low of $1,743,908 to $2,782,440.

LIST OF BIDDERS:

1. L. E. Dixon Co., Los Angeles, Calif. (contract) $1,743,908
2. M. H. Golden, Walter Trepte, and Cecil B. Grove, San Diego, Calif. 2,463,183
3. Atkinson-Kier Co., San Francisco, Calif. 2,624,089
4. Daley Corp., and V. R. Dennis Constr. Co., Los Angeles, and San Diego, Calif. 2,782,440

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Class 1 excav. below El. 460, except Cl. 4	35,000 c. y.	$3.75	$5.11	$5.00
2. Cl. 2 excav. above El. 460, exc. Cl. 3, 4, and 5	55,000 c. y.	3.75	5.11	5.50
3. Cl. 3 outlet works excav.	800 c. y.	3.75	6.00	7.00
4. Cl. 4 excav. for drain tile	100 c. y.	5.00	9.00	40.00
5. Cl. 5 excav. for traffic by-pass	2,000 c. y.	1.00	4.10	1.25
6. Backfill	10,000 c. y.	.30	.35	.75
7. Prepare fndn. for conc.; horizontal projection only	11,000 s. y.	3.00	4.50	5.00
8. Percussion drilled grout holes, to 25-ft	2,500 l. f.	.50	1.50	1.00
9. Rotary drilled grout holes, to 25-ft	2,000 l. f.	1.50	1.90	2.50
10. As above, 25 to 50-ft. deep	1,500 l. f.	1.50	1.90	2.50
11. As above, 50 to 100-ft. deep	1,000 l. f.	1.50	1.90	2.50
12. As above, over 100-ft. deep	500 l. f.	1.50	1.90	2.50
13. Drill hardened grout from hole, 0 to 25-ft. deep	1,000 l. f.	.60	.30	1.00
14. As above, between 25 and 50-ft	750 l. f.	.60	.30	1.00
15. As above, between 50 and 100-ft	500 l. f.	.60	.30	1.50
16. As above, over 100-ft. deep	100 l. f.	.60	.30	2.00
17. 3-in. drainage holes, 0 to 25-ft	2,500 l. f.	3.10	3.70	3.50
18. 3-in. drainage holes, over 25-ft	1,250 l. f.	3.10	3.70	3.50
19. Grout connection to each hole	275 ea.	2.00	2.90	5.00
20. Grout, up to 10 c. f. in each hole	1,750 c. f.	1.78	3.00	2.50
21. Grout, from 11th to 25th c. f	3,000 c. f.	1.00	1.15	2.00
22. Grout, in excess of 25 c. f. in each hole	3,250 c. f.	.75	.85	1.50
23. Remove grout from holes, when no drilling required	5,000 l. f.	.20	.12	.75
24. 2-in. steel grout pipe	2,000 l. f.	.36	.57	.75
25. 2½-in. steel pipe	1,000 l. f.	.50	1.00	1.00
26. 6-in. drain tile	500 l. f.	.40	.40	1.50
27. 8-in. drain tile	500 l. f.	.50	.70	1.75
28. 12-in. half-round drain tile, incl. cr. rock	1,100 l. f.	.77	.90	2.50
29. Class 1 conc., mass conc. in place	300,000 c. y.	4.15	5.90	6.24
30. Cl. 2 conc., spillway guide walls	200 c. y.	16.00	29.00	25.00
31. Cl. 3 conc.; outlet tower, exc. base	600 c. y.	15.00	27.50	25.00
32. Cl. 4 conc.; adit and shaft to outlet tower	50 c. y.	25.00	40.00	30.00
33. Cl. 5 conc. in parapets	140 c. y.	16.00	41.00	35.00
34. Cl. 6 conc. in valve chamber	70 c. y.	30.00	50.00	35.00
35. Cl. 7 conc. in exterior stairs	60 c. y.	30.00	38.00	25.00
36. Cl. 8 conc. to fill temp. dam openings	2,000 c. y.	5.00	5.00	7.00
37. Reinforcing steel	175,000 lb.	.05	.07	.055
38. Copper grout stops around temp. openings	400 l. f.	1.40	.55	2.50
39. Copper water seals in contrac. joints	2,500 l. f.	1.40	1.00	2.00
40. Forming 8-in. vertical drains	11,500 l. f.	.40	.00	.50
41. 16-ga. copper downspout, vert. drains	25 ea.	10.00	1.00	15.00
42. Plug and copper tube, lower portion of vert. drains in gallery	50 ea.	16.00	1.00	15.00
43. Inst. grout tubing, fittings and units (furn. by City)	6,000 lb.	.15	.10	.25
44. Inst. cast iron, cast steel and wr. steel pipe, fittings, gate valves (City)	170,000 lb.	.02	.047	.05
45. 30-in. c. i. saucer valves, cast st. cover	50,000 lb.	.12	.41	.45
46. As above, 36-in	3 ea.	1,113.00	2,500.00	2,500.00
47. Misc. c. i. covers and frames	5,000 lb.	.15	.20	.20
48. C. i. covers for drainage wells	65 ea.	9.00	7.00	20.00
49. Struc. steel doors, galv.; outlet tower	100 lb.	.65	1.00	1.00
50. Structural steel I-beams	1,300 lb.	.22	.20	.30
51. 12-in. outlet tower vents	2 ea.	15.00	25.00	20.00
52. Str. steel covers, rim angles; out. tower	1,300 lb.	.26	.30	.35
53. Outlet extension	1 er.	150.00	185.00	200.00
54. Fish screen	1 ea.	250.00	255.00	430.00
55. Galv. steel ladders and guards	3,000 lb.	.30	.30	.40
56. ¼-in. steel plate gallery gates	2,000 lb.	.45	.35	.50
57. Misc. structural steel	10,000 lb.	.15	.18	.40
58. Galv. metal covered valve chamber doors	1 pr.	50.00	100.00	200.00
59. 3½ x 4-ft. galv. steel sash, hinged, with wire glass and copper screens	3 ea.	65.00	25.00	50.00
60. Stationary power-driven hoist	1 ea.	900.00	960.00	1,250.00
61. 5-ton chain block and trolley	1 ea.	400.00	170.00	400.00
62. Swivel sheaves	10 ea.	26.00	8.00	40.00
63. ⅝-in. galv. iron chains for out. works	1,400 l. f.	90	.70	1.50
64. 2-in. iron pipe handrailing assem.	1,200 l. f.	2.50	1.50	4.00
65. 2½-in. iron pipe handrailing assem.	900 l. f.	2.50	2.25	4.50
66. 34-in. galv. iron 2 x 4-in. fencing	900 l. f.	.13	.25	.30
67. Flag pole	1 ea.	70.00	75.00	200.00
68. Bronze inscription plates	275 lb.	1.08	.85	1.25
69. Enameled water level gage	175 l. f.	.80	1.05	3.00
70. Timber structures, No. 1 O. P	5 Mbf.	100.00	100.00	200.00
71. Galv. iron pipe and housing for water level recorder, and inst. recording instruments furn. by City	L. S.	341.00	290.00	1,200.00
72. Electr. wk.; light. sys. and power outlets	L. S.	1,200.00	4,000.00	4,000.00
73. Water furn. for City camp	400,000 c. f.	.10	.10	.10
74. Conc. forms and misc. work for highway tunnel	L. S.	6,635.00	3,000.00	3,500.00

WATER SUPPLY AND SEWERAGE SYSTEMS, CALIFORNIA

OWNER: Bureau of Reclamation, Sacramento, Calif.

PROJECT: Construction of water supply and sewerage facilities for sidings No. 1, 2, 4 and 6 of the relocated Southern Pacific Railroad, Kennett Division, Central Valley Project, California. Work located between Delta and Redding, Calif. Involves pipe line, well, pumping plants, chlorinating units, concrete dam, locomotive water supply columns, septic tanks and disposal fields. Natural-rock asphalt surfacing to be placed between tracks and about station buildings at sidings No. 2 and 6. Road to be constructed from main highway to buildings at siding No. 4, and to be surfaced with rock taken from spoil banks in vicinity of road.

CONDITIONS: Contractor to furnish gravel, rock, backfill materials, form materials, wire, water, insulating tape and compounds, and all other materials not part of completed structure. Government to furnish all other materials. Work to be completed in 170 calendar days. Rail and highway transportation facilities available. Wage rates specified as minimums are: skilled labor, $1.10 to $1.75 per hr.; semi-skilled, 82c. to $1.25; common, 75 to 80c.

BIDS: Four bids were opened August 29, 1941, ranging from the low of $100,089 to $169,142.

LIST OF BIDDERS:

1. Scheumann and Johnson, Eureka, Calif. $100,089
2. Loveland & Co., Ltd., San Francisco, Calif. 149,305
3. R. G. Clifford, C. M. Elliott, and Stroud-Seabrook, South San Francisco, Calif. 152,778
4. E. T. Haas Co., San Francisco, Calif. 169,142

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Common excavation, road	1,200 c. y.	$1.00	$0.56	$0.66
2. Place road surfacing	330 c. y.	1.00	.24	.70
3. Cr. gravel or cr. rock base crse. for surf.	230 c. y.	6.00	9.65	5.00
4. Watering	5 M gal.	4.00	23.88	15.00
5. Place natural-rock asph. surf.	160 c. y.	6.00	11.14	4.50
6. Apply seal coat	1,350 s. y.	.20	.16	.06

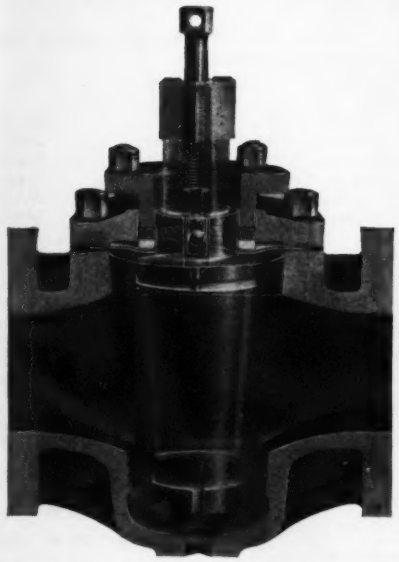
SEWAGE PLANTS SUCH AS THIS

Where Experience Writes the Specifications

It's NORDSTROM

LUBRICATED PLUG

VALVES



SANITATION engineers, who realize fully the severe field conditions under which valves must operate dependably in sewage disposal systems, invariably write Nordstrom Lubricated Plug Valves into construction specifications. Nation-wide use in municipal plants has definitely proved that quick quarter-turn operation, and 100% efficiency, even under most difficult conditions of corrosion and abrasion, place Nordstroms head and shoulders above other types for meeting the stiff requirements of sewage treatment. Nordstroms not only outlive other valves several times over, but the lubricated plug valve principle makes them vastly superior in successfully coping with the heterogeneous nature of the fluids which must be handled. It is in no way surprising, then, that for reasons of economy, efficiency and dependability, Nordstrom Valves figure prominently in the construction of today's most modern sewage plants.

We'll gladly send you illustrated literature, giving complete details concerning Nordstrom Lubricated Plug Valves for Sewage Disposal Plants. Write today.

TO ACCURATELY MEASURE GAS AND WATER use EMCO SEWAGE GAS METERS and PITTSBURGH HOT OR COLD WATER METERS

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NATIONAL METER DIVISION, Brooklyn, N. Y.

KANSAS CITY · PHILADELPHIA · SAN FRANCISCO · LOS ANGELES · SEATTLE · HOUSTON · COLUMBIA · BUFFALO

7. Excav., all classes; tunnels, shaft	190 c. y.	20.00	52.53	80.00
8. Excav., common; for pipe trenches	5,000 c. y.	2.25	3.58	4.00
9. Excav., rock; for pipe trenches	1,400 c. y.	2.25	7.96	4.00
10. Com. excav.; drain. ditches at disp. fields	200 c. y.	3.00	3.58	2.50
11. Com. excav.; struct., except pump plant inlets	1,050 c. y.	3.00	3.98	3.00
12. Rock excav.; as above	415 c. y.	4.00	7.96	7.00
13. Com. excav.; pump plant inlets	1,625 c. y.	4.00	4.78	3.00
14. Rock excav.; pump plant inlets	750 c. y.	4.00	4.76	3.75
15. Backfill of pipe trenches	4,040 c. y.	.50	1.83	1.50
16. Backfill about structures	2,400 c. y.	.50	.80	.75
17. Compact backfill in pipe trenches	2,270 c. y.	1.00	2.39	1.60
18. Compact backfill about structures	105 c. y.	2.00	2.39	1.60
19. Rock fills	320 c. y.	5.00	4.76	5.20
20. Concrete in structures	790 c. y.	25.00	39.40	42.00
21. Conc. in tunnels and shaft	80 c. y.	50.00	63.67	65.00
22. Place reinforcement bars	26,600 lb.	.03	.06	.04
23. Lay 54-in. corr. metal pipe	70 l. f.	2.00	2.39	5.00
24. Lower exist. culvert under railroad	L. S.	300.00	796.00	500.00
25. 8-in. perf. corr. met. pipe drains	200 l. f.	2.00	3.18	2.50
26. Lay 8-in. c. i. soil pipe, calked joints	75 l. f.	1.50	.80	1.00
27. Lay 6-in. c. i. soil pipe, calked joints	230 l. f.	1.50	.80	1.00
28. Lay 4-in. c. i. soil pipe, calked joints	240 l. f.	1.50	.80	.80
29. Lay 8-in. clay sew. pipe, poured joints	340 l. f.	.30	.64	.50
30. Lay 6-in. clay sew. pipe, poured joints	1,500 l. f.	.30	.64	.50
31. Lay 4-in. clay sew. pipe, poured joints	1,110 l. f.	.20	.64	.45
32. Lay 4-in. drain tile, embedded in grav	2,910 l. f.	.80	1.83	.50
33. Lay 8-in. welded steel pipe	17,600 l. f.	.50	.25	.70
34. Lay 6-in. welded steel pipe	5,300 l. f.	.40	.25	.65
35. Lay 6-in. galv. steel pipe	465 l. f.	.60	.80	2.00
36. Lay 4-in. galv. steel pipe	4,850 l. f.	.30	.48	.80
37. Lay 3-in. galv. steel pipe	50 l. f.	.50	.48	.50
38. Lay 2½-in. galv. steel pipe	770 l. f.	.40	.48	.20
39. Lay 2-in. galv. steel pipe	620 l. f.	.30	.48	.15
40. Lay 1-in. galv. steel pipe	60 l. f.	.50	.32	.15
41. Lay ¾-in. galv. steel pipe	150 l. f.	.50	.32	.15
42. Lay 12-in. c. i. water pipe, calked jts	480 l. f.	1.50	1.59	2.30
43. Place air and vacuum valves	3 ea.	15.00	15.92	10.00
44. Place 12-in. gate valves	6 ea.	20.00	23.88	18.00
45. Place 8-in. gate valves	3 ea.	20.00	15.92	12.00
46. Place 6-in. gate valves	3 ea.	20.00	15.92	8.00
47. Place 4-in. gate valves and boxes	17 ea.	14.00	15.92	4.00
48. Place 2½-in. gate valves and boxes	1 ea.	15.00	11.94	4.00
49. Place 2-in. gate valves and boxes	2 ea.	15.00	11.94	3.00
50. Place 6-in. check valve	1 ea.	15.00	15.92	8.00
51. Place altitude-control valve	2 ea.	75.00	79.60	15.00
52. Place fire hydrants	13 ea.	30.00	55.71	22.00
53. Well at siding No. 2, except conc. and reinf.	L. S.	2,500.00	796.00	2,000.00
54. Pump house at siding No. 1 pump plt	L. S.	300.00	334.00	300.00
55. Pump house at siding No. 2 pump plt	L. S.	200.00	231.00	150.00
56. Pump house at siding No. 6 pump plt	L. S.	500.00	557.00	360.00
57. Hose-reel boxes, complete	13 ea.	50.00	39.80	15.00
58. Erect timber in structures	11.7 M bm.	50.00	79.60	75.00
59. Inst. std. steel and c. i. pipe, fittings and valves	7,800 lb.	.15	.10	.15
60. Install pumping units	5,500 lb.	.10	.24	.15
61. Install chlorinating units	1,400 lb.	.20	.24	.10
62. Install water columns	15,750 lb.	.08	.08	.06
63. Install miscellaneous metalwork	9,850 lb.	.10	.11	.12
64. Inst. electrical metal conduit	160 l. f.	1.00	1.59	.20
65. Inst. electrical conductors	1,800 lb.	.50	.16	.30
66. Install electrical apparatus	700 lb.	1.00	.40	.50

SEWAGE PLANT BUILDINGS CHICAGO, ILL.

OWNER: Sanitary District of Chicago, Chicago, Ill.; W. K. Trinkhaus, engineer; F. L. Finlayson, architect.

PROJECT: Construction of dried-sludge building, conveyor tunnel extension, elevator tower, foundations and superstructure, conveyor bridge, track work, drainage and miscellaneous construction in connection with Stickney Sewage Disposal Plant (Division G), Pershing Road and 52nd Avenue, Cook County, Ill.

CONDITIONS: Contractor to furnish all materials, plant and labor. Rail and highway transportation facilities available. Wage rates are in accord with existing Chicago union scales.

BIDS: Twelve bids were received February 20, 1941, ranging from the contract low of $172,961 to $261,765.

LIST OF BIDDERS:

1. Marsch Constr. Co., Chicago, Ill. (contract) $172,961
2. George Cassidy & Son, Chicago, Ill 177,318
3. Michael J. McDermott Co., Chicago, Ill 181,598
4. Joseph J. Duffy, Chicago, Ill 191,595
5. James McHugh & Son, Chicago, Ill 191,800
6. E. H. Marhoefer, Jr., Co., Chicago, Ill 193,172
7. Harvey A. Hanson, Chicago, Ill 204,854
8. Paschen Constr., Inc., Chicago, Ill 208,800
9. M. Pontarelli & Sons, Chicago, Ill 223,378
10. E. L. Archibald Co., Chicago, Ill 228,423
11. Santucci Constr. Co., Skokie, Ill 231,500
12. John C. Tully Co., Chicago, Ill 261,765

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	5,000 c. y.	$1.50	$1.6	$1.00
2. Sand, gravel, or broken stone fill	1,200 c. y.	1.80	2.2	2.00
3. Class A concrete	2,200 c. y.	16.00	15.7	18.00
4. Class B concrete	25 c. y.	8.00	8.0	8.00
5. Reinforcing steel	265,000 lb.	.0425	.03	.05
6. Structural steel	540,000 lb.	.085	.0	.08
7. Remove existing concrete	200 c. y.	20.00	16.0	20.00
8. Cinder surfacing	1,250 s. y.	.20	.2	.70
9. Misc. iron castings	10,600 lb.	.08	.1	.08
10. Cast iron pipe fittings	185,000 lb.	.06	.0	.07
11. 8-in. vitr. sewer pipe	2,650 l. f.	.60	.8	1.00
12. 12-in. vitr. sewer pipe	400 l. f.	1.00	1.1	1.50
13. Miscellaneous pipe work	L.S.	125.00	165.0	300.00
14. Miscellaneous brick work	25 c. y.	25.00	35.0	25.00
15. Special work, pipe lines and drains	L.S.	200.00	800.00	750.00
16. Move track hoist, car puller, hoist house	L.S.	500.00	950.00	350.00
17. Track work	L.S.	14,008.00	12,200.00	9,300.00
18. Dried sludge building	L.S.	28,120.00	27,100.00	27,500.00
19. Dried sludge elevator	L.S.	5,204.00	4,100.00	4,000.00
20. Dried sludge conveyor housing	L.S.	3,767.00	2,900.00	3,000.00

SEWERAGE TUNNEL CLEVELAND, OHIO

OWNER: City of Cleveland, J. C. Wenrick, city engineer.

PROJECT: Construction of sewerage diversion tunnel for oil and waste materials in Kingsbury Run from Cuyahoga River to East 37th St., Cleveland, Ohio. Maximum depth, 80-ft.; average depth, 40-ft.

CONDITIONS: Contractor to furnish all materials and complete work in 225 working days. Rail, highway and water transportation facilities available near site of work. Wage rates are: skilled labor, $1.50 per hr.; semi-skilled, $1.25; and common, $1.00.

BIDS: Six bids were received November 6, 1941, ranging from the contract low of $451,195 to $569,020.

LIST OF BIDDERS:

1. The Kalill Co., Cleveland, Ohio (contract) $451,195
2. Square Construction Co., Cleveland, Ohio 513,870
3. Curro Construction Co., Cleveland, Ohio 543,253
4. Domenic Nero Constr. Co., Cleveland, Ohio 554,600
5. Christopher & Co., Inc., Cleveland, Ohio 563,199
6. National Construction Co., Cleveland, Ohio 569,020

Section No. 1

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Increaser from 14'10"x9' to 16'x8'	10 l.f.	$140.00	$200.00	$170.00
2. 14'10"x9' rein. conc. culvert	73 l.f.	135.00	175.00	170.00
3. No. 5 "C" brick sewer	44 l.f.	100.00	30.00	20.00
4. No. 4 "C" brick sewer	28 l.f.	90.00	20.00	20.00
5. Manhole on conc. culvert (Item 2)	1 ea.	300.00	100.00	150.00
6. Std. manhole on No. 5 sewer	1 ea.	250.00	100.00	150.00
7. Make connection to culvert under B. & O. RR tracks	1 ea.	125.00	1,000.00	250.00
8. Make conn. to Broadway sewers	2 ea.	125.00	50.00	50.00

Section No. 2

9. Reducer from 14'10" circ. brick sewer to 14'10"x9' rein. box culvert	20 l.f.	140.00	200.00	170.00
10. Increaser from 14'10"x9' box culv. to 14'10" circ. brick sewer	20 l.f.	140.00	200.00	170.00
11. 14'10"x9' rein. conc. culvert near Broadway	188 l.f.	140.00	175.00	170.00
12. 14'10"x9' rein. conc. culv. near E. 34 St.	71 l.f.	140.00	110.00	170.00
13. 14'10" circ. 4-ring brick sewer in tunnel	1,741 l.f.	118.00	175.00	167.50
14. Steel tunnel liner plates	809 ton	120.00	90.00	92.00
15. 14'10" circ. brick sewer in open cut	46 l.f.	140.00	100.00	170.00
16. Manhole (No. 2) on rein. conc. culv	1 ea.	350.00	100.00	150.00
17. Special manhole (No. 3)	1 ea.	5,500.00	3,000.00	5,500.00
18. 4'x7' rein. conc. stub and brick bulkhead	1 ea.	50.00	200.00	125.00
19. Std. inlet basin	1 ea.	60.00	80.00	100.00
20. 12" catch basin pipe, incl. excav. and backfill	10 l.f.	2.00	6.00	3.00
21. Brick bulkhead in Kingsbury Run	1 ea.	75.00	120.00	1,000.00

Section No. 3

22. 14'10"x9' rein. conc. culvert	515 l.f.	135.00	110.00	170.00
23. Junction chamber, complete	1 ea.	1,500.00	2,000.00	3,000.00
24. 12'x9' rein. conc. stub, incl. temp. brick bulkhead	4 l.f.	100.00	100.00	150.00
25. 10'x9' rein. conc. culvert	21 l.f.	136.00	80.00	170.00
26. Spec. manhole with open grate cover	1 ea.	400.00	100.00	150.00
27. Spec. manhole on 10'x9' rein. conc. culv. with open grate cover	1 ea.	350.00	100.00	150.00
28. Connection to culvert at E. 37th St	1 ea.	100.00	300.00	250.00
29. Standard inlet basin	1 ea.	60.00	100.00	100.00
30. 12" catch basin, complete	10 l.f.	2.00	10.00	3.00
31. 6" vitrified pipe	10 l.f.	.50	5.00	2.50
32. 8" vitrified pipe	10 l.f.	.60	8.00	2.75

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Float cage
Deaerated make up storage
Overflow loop seal
Recording thermometer
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Deaerated make up storage
To wash water pump
To filter
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WATER CONDITIONING HEADQUARTERS

SEWER IMPROVEMENTS
CORPUS CHRISTI, TEXAS

OWNER: City of Corpus Christi, Tex., and Defense Public Works Division of the Federal Works Agency. Myers & Noyes, Corpus Christi, engineers.

PROJECT: Construction of an activated sludge sewage disposal plant, and 77,000 feet of 6- to 24-in. storm and sanitary sewers in Corpus Christi, Tex. Depths of sewer lines range from 0 to 20 feet.

CONDITIONS: Contractor to furnish all materials. Rail, highway and water transportation facilities available. Delays in delivery of strategic items prevalent at this time may occasion increased costs. Wage rates are: skilled labor, $1.00 to $2.00 per hr.; semi-skilled, 50 to 60c.; and common labor, 40 to 50c. per hr.

BIDS: Four bids were received January 22, 1942 on all of the items listed below. They range from the low of $483,984 to $586,845.

LIST OF BIDDERS:

1. Brown & Root, Corpus Christi and Austin, Tex. (low bidder) $483,984
2. J. DePuy & Sons, San Antonio, Tex. 519,799
3. W. G. Cullum Co., Dallas, Tex. 536,375
4. Sherman Machine & Iron Works, Oklahoma City, Okla. 562,678
5. E. L. Dalton, Dallas, Tex. 586,845

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Re-lift pump station	L. S.	$25,855.00	$25,355.00	$37,245.00
2. Sewage disposal plant	L. S.	253,222.00	256,720.00	268,735.00
3. 24-in. vit. tile pipe, 0–6-ft. deep	520 l. f.	6.17	6.70	6.85
4. 24-in. vit. tile pipe, 6–8-ft. deep	80 l. f.	6.32	6.75	6.90
5. 24-in. vit. tile pipe, 8–10-ft. deep	55 l. f.	6.50	7.05	7.10
6. 24-in. vit. tile pipe, 10–12-ft. deep	75 l. f.	6.83	7.30	7.40
7. 24-in. vit. tile pipe, 12–14-ft. deep	165 l. f.	6.97	7.38	6.75
8. 24-in. vit. tile pipe, 14–16-ft. deep	505 l. f.	7.22	7.45	6.10
9. 24-in. vit. tile pipe, 16–18-ft. deep	300 l. f.	7.45	7.60	6.78
10. 24-in. vit. tile pipe, 18–20-ft. deep	300 l. f.	5.89	7.65	6.85
11. 21-in. vit. tile pipe, 6–8-ft. deep	930 l. f.	4.22	4.42	4.40
12. 21-in. vit. tile pipe, 8–10-ft. deep	6,020 l. f.	4.31	4.43	4.56
13. 21-in. vit. tile pipe, 10–12-ft. deep	4,800 l. f.	4.41	4.78	4.65
14. 21-in. vit. tile pipe, 12–14-ft. deep	1,100 l. f.	4.48	4.90	4.80
15. 21-in. vit. tile pipe, 14–16-ft. deep	4,550 l. f.	4.50	5.03	4.92
16. 21-in. vit. tile pipe, 16–18-ft. deep	400 l. f.	4.67	5.30	5.20
17. 18-in. vit. tile pipe, 10–12-ft. deep	550 l. f.	3.23	3.62	3.60
18. 18-in. vit. tile pipe, 12–14-ft. deep	650 l. f.	3.30	3.80	3.72
19. 18-in. vit. tile pipe, 14–16-ft. deep	1,400 l. f.	3.45	3.96	3.85
20. 15-in. vit. tile pipe, 14–16-ft. deep	1,800 l. f.	2.91	3.34	3.30
21. 12-in. vit. tile pipe, 10–12-ft. deep	1,400 l. f.	1.67	1.96	1.92
22. 12-in. vit. tile pipe, 12–14-ft. deep	1,300 l. f.	1.85	2.07	2.05
23. 12-in. vit. tile pipe, 6–8-ft. pipe	50 l. f.	1.55	1.78	1.74
24. 12-in. vit. tile pipe, 8–10-ft. deep	50 l. f.	1.60	1.92	1.83
25. 12-in. vit. tile pipe, 10–12-ft. deep	700 l. f.	1.70	2.00	1.95
26. 12-in. vit. tile pipe, 12–14-ft. deep	400 l. f.	1.85	2.01	2.00
27. 10-in. vit. tile pipe, 6–8-ft. deep	100 l. f.	1.20	1.35	1.34
28. 10-in. vit. tile pipe, 8–10-ft. deep	100 l. f.	1.25	1.40	1.40
29. 10-in. vit. tile pipe, 10–12-ft. deep	6,000 l. f.	1.33	1.55	1.48
30. 10-in. vit. tile pipe, 12–14-ft. deep	4,000 l. f.	1.46	1.67	1.65
31. 10-in. vit. tile pipe, 14–16-ft. deep	100 l. f.	1.65	1.85	1.85
32. 10-in. vit. tile pipe, 16–18-ft. deep	100 l. f.	1.80	2.05	2.00
33. 8-in. vit. tile pipe, 0–6-ft. deep	2,000 l. f.	.93	1.08	1.05
34. 8-in. vit. tile pipe, 6–8-ft. deep	9,000 l. f.	.97	1.12	1.10
35. 8-in. vit. tile pipe, 8–10-ft. deep	4,000 l. f.	1.05	1.21	1.18
36. 8-in. vit. tile pipe, 10–12-ft. deep	2,000 l. f.	1.15	1.36	1.32
37. 8-in. vit. tile pipe, 12–14-ft. deep	400 l. f.	1.36	1.54	1.50
38. 8-in. vit. tile pipe, 14–16-ft. deep	400 l. f.	1.52	1.70	1.65
39. 8-in. vit. tile pipe, 16–18-ft. deep	100 l. f.	1.70	1.90	1.85
40. 6-in. vit. tile pipe, 0–6-ft. deep	11,000 l. f.	.65	.80	.76
41. 6-in. vit. tile pipe, 6–8-ft. deep	10,000 l. f.	.75	.85	.80
42. 6-in. vit. tile pipe, 8–10-ft. deep	200 l. f.	.77	.95	.85
43. Class A concrete	10 c. y.	35.00	35.00	29.50
44. Class B concrete	260 c. y.	20.00	21.00	19.50
45. Class C concrete	800 c. y.	10.25	16.75	16.00
46. Manholes, 0 to 6-ft. deep	70 ea.	72.50	85.00	85.00
47. Manholes, extra depth	350 ft.	11.60	15.00	12.00
48. Sheeting	1 M bm.	75.00	110.00	112.50
49. Cleanouts	65 ea.	17.40	18.50	18.75
50. Drop manholes, 0 to 6-ft. deep	10 ea.	82.00	100.00	95.00
51. Drop manholes, extra depth	60 ft.	13.50	17.50	16.50
52. 6-in. vit. tile pipe, 10–12-ft. deep	200 l. f.	.90	.90	.95
53. 6-in. vit. tile pipe, 12–14-ft. deep	200 l. f.	1.10	1.10	1.15
54. 6-in. valves	5 ea.	56.00	70.00	67.20
55. Fire hydrants	2 ea.	103.00	140.50	143.30
56. Reinforcing steel	25,000 lb.	.06	.10	.095
57. Shell	2,100 c. y.	2.50	2.85	2.81
58. 6-in. water line, c.i.p.	4,600 l. f.	1.72	2.15	2.05
59. Cedar piling	1,000 l. f.	1.00	1.75	1.71
60. Earthwork on road	5,000 c. y.	.35	.50	.46
61. Earthwork on outfall ditch	5,000 c. y.	.25	.48	.44

SEWAGE PLANT ADDITIONS
MIDDLETOWN, PA.

OWNER: War Department, U. S. Engineer Office, Baltimore, Md.

PROJECT: Construction of sanitary sewerage plant additions located near north bank of Susquehanna River at Middletown Air Depot, Olmsted Field, Middletown, Dauphin County, Pa. Includes construction of 6-in. and 8-in. sanitary sewers, manholes and pumping station No. 3 in shop area; 10-in. sewer from existing sewage treatment plant to pumping station No. 1, on land side of levee now under construction; construction of pumping station No. 1; 8-in. cast iron force main from pumping station No. 1 to new sewage treatment plant near Post Run; and a 300,000 gallon-per-day single stage biofilter sewage treatment plant between Post Run and access ramp to flood control pumping station now being built. All structures to be of reinforced concrete.

CONDITIONS: Contractor to furnish all materials and complete work in 120 calendar days. Rail and highway transportation facilities available. Wage rates specified as minimums are: skilled labor, 87½c. to $1.75 per hr.; semi-skilled, 50c. to $1.25; and common, 65c.

BIDS: Six bids were opened September 23, 1941, ranging from the low of $122,945 to $162,711. Engineer's estimate $100,090.

LIST OF BIDDERS:

1. Thomas M. Flanaghan, Reading, Pa. $122,945
2. The Gondos Co., Philadelphia, Pa. 126,695
3. E. H. Marhoefer, Jr., Co., Chicago, Ill. 144,800
4. Sordoni Constr. Co., Forty Fort, Pa. 146,425
5. Ritter Bros., Harrisburg, Pa. 151,000
6. Boyd H. Kline, Bloomsburg, Pa. 162,711

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Diversion, care of water and sewage	L. S.	$3,500.00	$10,000.00	$4,500.00
2. Stripping	1,600 c. y.	.25	.30	.30
3. Common excavation	1,600 c. y.	1.60	1.20	1.25
4. Structure excavation	430 c. y.	5.50	5.00	5.00
5. Rock excavation	40 c. y.	8.00	8.00	7.00
6. Trench excav. and bkfill. for sewers in shop area	1,900 c. y.	3.00	2.00	5.00
7. As above, for 8-in. c. i. force main.	1,800 c. y.	1.00	2.00	4.00
8. As above, at treatment plt. site.	450 c. y.	1.50	2.00	4.00
9. As above, for 2-in. water-supply line	300 c. y.	1.25	2.00	2.50
10. Lumber, left in place	35 Mbm.	50.00	40.00	40.00
11. Earth backfill at structures	800 c. y.	1.20	.75	1.50
12. Earth fill	1,700 c. y.	.60	1.10	.80
13. Top soil	800 c. y.	1.20	1.00	2.25
14. Gravel surfacing	90 c. y.	4.50	6.00	3.50
15. Concrete	650 c. y.	35.00	32.00	33.00
16. Reinforcing steel	90,000 lb.	.07	.065	.07
17. Misc. iron and steel	10,000 lb.	.22	.13	.20
18. Fence, complete	L. S.	2,000.00	1,500.00	1,728.00
19. Std. manhole, to 4-ft. depth, incl. c. i. frame and cover, steps and bottom	14 ea.	80.00	75.00	76.00
20. Each add'l. vertical foot in depth of manhole in excess of 4-ft.	55 l. f.	8.00	10.00	10.00
21. 6-in. vitr. clay pipe	1,900 l. f.	.40	.90	.60
22. 8-in. vitr. clay pipe	2,000 l. f.	.60	1.20	.75
23. 10-in. vitr. clay pipe	600 l. f.	.90	1.75	1.00
24. Cut and remove concrete	80 c. y.	5.00	6.00	20.00
25. Conc. repaving and cradles	60 c. y.	17.00	22.00	25.00
26. Cleanouts	5 ea.	15.00	20.00	40.00
27. 8-in. cast iron force main	4,600 l. f.	2.25	2.20	2.60
28. 2-in. water supply line	1,500 l. f.	.60	.70	.70
29. Raw sewage and recirculating pumps and motors, incl. controls	L. S.	3,200.00	3,120.00	3,600.00
30. Sludge pump and controls	L. S.	750.00	740.00	711.00
31. Comminuting mechanism	L. S.	2,300.00	2,100.00	1,971.00
32. Furn. and inst. all valves	L. S.	4,000.00	3,500.00	6,400.00
33. All cast iron pipe and fittings, furnish and lay	L. S.	6,500.00	5,650.00	11,500.00
34. Primary clarifier equipment	L. S.	4,000.00	3,830.00	3,567.00
35. Secondary clarifier equipment	L. S.	3,700.00	3,680.00	3,389.00
36. Biofilter rotary distributor	L. S.	2,000.00	1,900.00	1,800.00
37. Sludge digester equipment	L. S.	4,200.00	4,420.00	3,781.00
38. Automatic chlorinator	L. S.	4,400.00	4,150.00	4,700.00
39. Flow recorder	L. S.	550.00	525.00	750.00
40. Plumbing, complete	L. S.	850.00	1,200.00	3,100.00
41. Sludge beds	L. S.	1,375.00	1,270.00	2,100.00
42. Biofilter stone, tile and vents	L. S.	1,500.00	2,100.00	1,904.00
43. Electrical work, complete	L. S.	9,450.00	8,300.00	6,600.00
44. Heating and ventilating work	L. S.	275.00	320.00	350.00
45. Abandonment of existing sewage disposal plant	L. S.	600.00	1,000.00	600.00
46. Doors, windows and screens	L. S.	450.00	630.00	600.00

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SEWAGE TREATMENT PLANT
BROOKLYN, N. Y.

OWNER: City of New York, N. Y., Dept. of Public Works.

PROJECT: Structures and equipment (Contract 4) and piping (Contract 5) in connection with the 26th Ward Sewage Treatment Works, on Miller and Schenck Avenues, and the Belt Parkway, Brooklyn, N. Y. Involves construction of primary sludge gallery entrance building; air meter building; return sludge meter building; digested sludge pumping station; primary sludge gallery; preliminary settling tanks; aeration tanks; return sludge gallery; final settling tanks; sludge thickening tanks; sludge digestion tanks, including piping gallery and valve chambers; entrance tunnel to digested sludge pumping station; and appurtenances to above work; piping; mechanical equipment; backfill around tank structures; electric conduit system; and miscellaneous work.

CONDITIONS: Contractor to furnish all materials and complete work in 550 calendar days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.10 to $2.25 per hr.; semi-skilled, $1.00 to $1.62½; and common, 87½¢.

BIDS: Three bids were received November 7, 1941 on Contract 4, ranging from $1,680,849 to $1,808,137. Four bids were received on the same date for Contract 5, ranging from $414,988 to $447,200. The low bidder on Contract 4, E. W. Foley, Inc., was the third low on Contract 5, but he stipulated that he would make a deduction of $46,000 if both contracts were awarded to him. This was lower than the amount considering each contract separately, and Foley was awarded both contracts about the 10th of December, $2,065,472.

Contract 4 and 5 combined

LIST OF BIDDERS:

1. E. W. Foley, Inc., Brooklyn, N. Y. (contract) $2,065,472
2. Charles F. Vachris, Inc., Brooklyn, N. Y. 2,106,607

Contract 4

1. E. W. Foley, Inc., Brooklyn, N. Y. (contract) $1,680,849
2. Charles S. Vachris, Inc., Brooklyn, N. Y. 1,704,470
3. P. Tomasetti Contracting Co., Brooklyn, N. Y. 1,808,137

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Soil bearing tests	7 ea.	$250.00	$500.00	$300.00
2. Earth excav. above elev. 0.0	21,000 c. y.	2.30	3.00	1.00
3. Earth excav. below elev. 0.0	44,000 c. y.	2.30	3.00	2.75
4. Earth excav. in trench	500 c. y.	3.50	3.00	3.00
5. Timber sheeting left in place (not over $30.00 per M. f.b.m.)	30 M.B.M.	30.00	30.00	30.00
6. Wood piles	6,800 l. f.	.85	.75	1.00
7. Portland cement	43,000 bbl.	2.25	1.95	2.10
8. Natural cement	7,000 bbl.	2.50	2.60	2.75
9. Concrete	33,000 c. y.	15.00	13.00	16.00
10. Precast conc. slabs	7,600 s. f.	.30	.10	.50
11. Sheet filler exp. joints	18,000 s. f.	.20	.25	.25
12. Sheet filler and rubber comp. exp. joints	700 s. f.	.65	.65	.75
13. Copper water stops	48,000 lb.	.35	.35	.50
14. Rubbed finish	137,000 s. f.	.07	.12	.10
15. Cement floor finish	32,400 s. f.	.14	.18	.10
16. Conc. floor hardening treat	30,700 s. f.	.04	.02	.02
17. Steel reinf	5,000,000 lb.	.055	.055	.055
18. Struct. steel	158,000 lb.	.07	.11	.10
19. Misc. wrought metals—steel, plain	125,000 lb.	.16	.15	.20
20. Misc. wrought metals—steel, galv	20,000 lb.	.21	.30	.25
21. Misc. wrought metals—bronze	16,000 lb.	.75	.15	.70
22. Misc. iron castings	10,000 lb.	.08	.08	.10
23. Steel floor grating—1 in	1,850 s. f.	1.25	1.35	1.60
24. Steel floor grating—1¼ in	160 s. f.	1.50	1.50	1.80
25. Steel floor grating—1½ in	2,200 s. f.	1.67	1.80	2.00
26. Threaded pipe railing (single)	3,300 l. f.	1.35	1.50	1.75
27. Threaded pipe railing (double)	6,000 l. f.	1.90	2.00	2.50
28. Stop planks and baffles	L. S.	3,100.00	7,500.00	6,000.00
29. Sludge thickener mechanisms	L. S.	11,600.00	12,200.00	15,000.00
30. Sludge collector mechanisms	L. S.	145,000.00	137,000.00	150,000.00
31. Dry chemical feed machine	L. S.	1,415.00	1,700.00	1,500.00
32. Pumping units	L. S.	82,000.00	86,000.00	100,000.00
33. Sludge digestion tank covers	L. S.	105,050.00	120,000.00	120,000.00
34. Sluice gates	L. S.	45,000.00	55,000.00	50,000.00
35. Hoisting equip	L. S.	3,000.00	4,000.00	3,500.00
36. Indicating and measuring devices	L. S.	3,600.00	4,200.00	3,500.00
37. Slide gates	L. S.	5,500.00	4,000.00	6,000.00
38. Elec. conduits—steel	43,000 lb.	.38	.45	.40
39. Elec. conduits—copper silicon alloy	1,800 lb.	1.20	1.00	1.20
40. Elec. conduits exp. joints	1,250 lb.	2.00	2.25	2.50
41. Elec. conduits—conn. at motors	L. S.	800.00	800.00	1,000.00
42. Misc. work	L. S.	4,039.00	14,000.00	7,500.00
43. Primary sludge gallery entrance bldg	L. S.	6,850.00	14,000.00	7,500.00
44. Air meter bldg	L. S.	6,550.00	14,000.00	7,500.00
45. Return sludge meter bldg	L. S.	24,050.00	49,000.00	30,000.00
46. Digester sludge pump station	L. S.	9,650.00	13,950.00	15,000.00
47. Misc arch. work	L. S.	7,800.00	9,000.00	7,000.00

Contract 5

LIST OF BIDDERS:

1. Harry Starkman & Bros., New York, N. Y. $414,988
2. H. Sand & Co., Inc., New York, N. Y. 416,650
3. E. W. Foley, Inc., Brooklyn, N. Y. (contract) 430,623
4. Charles F. Vachris, Inc., Brooklyn, N. Y. 447,200

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Earth excav	500 c. y.	$1.00	$10.00	$5.00
2. Timber sheeting left in place	10 M.B.M.	100.00	50.00	125.00
3. Portland cement	660 bbl.	2.50	2.50	2.25
4. Concrete	440 c. y.	16.00	30.00	30.00
5. Steel reinf	2,500 lb.	.22	.20	.075
6. Misc. wrought metals	5,000 lb.	.14	.20	.20
7. Iron castings	10,000 lb.	.22	.08	.10
8. Cast iron pipe lines	L. S.	120,347.00	113,000.00	120,000.00
9. Wrought iron pipes	L. S.	37,859.00	41,000.00	42,500.00
10. Valves	L. S.	34,712.00	32,000.00	37,500.00
11. Venturi meters and registers	L. S.	45,306.00	52,000.00	50,000.00
12. Air diffuser system	L. S.	117,968.00	108,000.00	115,000.00
13. Sludge lifts and sludge level indicators	L. S.	25,968.00	29,000.00	30,000.00
14. Indicating and measuring devices	L. S.	7,228.00	8,000.00	9,500.00
15. Misc. work	L. S.	11,960.00	11,000.00	5,500.00

SEWER EXTENSIONS, MARYLAND

OWNER: Washington Suburban Sanitary Comn., Hyattsville, Md., and the Defense Public Works Division of the FWA.

PROJECT: Extension of sewer lines to serve Public Buildings Administration housing development near Wheaton, Montgomery County, Md. Involves excavating, refilling, furnishing and laying of 95 ft. of 8-in., 855 ft. of 10-in., and 1,210 ft. of 12-in. vitrified pipe; and 5,100 ft. of 24-in. reinforced concrete pipe. Depths in general range from 6 to 12 ft.

CONDITIONS: Owner to furnish manhole frames, covers and steps; contractor to furnish all other materials and complete work in 90 calendar days. Rail facilities available to within 1½ miles of job site; highway transportation to site. Wage rates are: skilled labor, $1.25 to $2.00 per hr.; semi-skilled, 50c. to $1.25; and common, 85c.

BIDS: Seven bids received February 4, 1942, ranging from the contract low of $37,495 to $59,421.

LIST OF BIDDERS:

1. Leo Butler Co., Silver Spring, Md. (contract) $37,495
2. James J. Fitzgerald Cont'g. Co., Winchester, Mass. 38,167
3. Intercounty Constr. Co., Hyattsville, Md 38,394
4. J. and F. Tufano Sewer Constr. Corp., Ozone Park, L. I., N. Y. 47,976
5. Blackwell Engr. & Constr. Co., Arlington, Va 51,551
6. Peter D'Adamo Constr. Co., Baltimore, Md 52,430
7. DiMarco & Ciccone, Inc., White Plains, N. Y. 59,421

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 8-in. vit. pipe, 0-6-ft. deep	70 l. f.	$0.62	$1.00	$0.68
2. 8-in. vitr. pipe, 6-8-ft. deep	10 l. f.	.62	1.50	.73
3. 8-in. vitr. pipe, 8-10-ft. deep	10 l. f.	.70	2.25	.91
4. 8-in. vitr. pipe, 10-12-ft. deep	10 l. f.	.98	3.00	1.13
5. 10-in. vitr. pipe, 6-8-ft. deep	10 l. f.	.62	1.50	.73
6. 10-in. vitr. pipe, 8-10-ft. deep	700 l. f.	.70	2.25	.91
7. 10-in. vitr. pipe, 10-12-ft. deep	160 l. f.	.98	3.00	1.13
8. 12-in. vitr. pipe, 6-8-ft. deep	35 l. f.	.62	1.50	.77
9. 12-in. vitr. pipe, 8-10-ft. deep	1,150 l. f.	.70	2.25	.96
10. 12-in. vitr. pipe, 10-12-ft. deep	40 l. f.	.98	3.00	1.13
11. 24-in. rein. conc. pipe, 6-8-ft. deep	150 l. f.	.67	1.50	.97
12. 24-in. rein. conc. pipe, 8-10-ft. deep	3,330 l. f.	.77	2.25	1.37
13. 24-in. rein. conc. pipe, 10-12-ft. deep	1,640 l. f.	1.08	3.00	1.55
14. 24-in. rein. conc. pipe, 12-14-ft. deep	30 l. f.	1.35	3.75	5.33
15. 24-in. rein. conc. pipe, 14-16-ft. deep	10 l. f.	1.80	4.88	6.00
16. Manholes	190 l. f.	10.80	10.00	18.00
17. 8-in. vit. sew. pipe, furn. and lay	95 l. f.	1.40	.70	.78
18. 10-in. vit. sew. pipe, furn. and lay	855 l. f.	1.57	.93	1.00
19. 12-in. vit. sew. pipe, furn. and lay	1,210 l. f.	1.80	1.13	1.22
20. 24-in. rein. conc. pipe sew., furn. and lay	5,100 l. f.	4.24	2.60	3.70
21. Class C conc.: encasement	22 c. y.	20.00	11.00	18.00
22. Class D conc.: cradle	6 c. y.	19.00	10.50	18.00
23. Rock excavation	50 c. y.	10.80	8.00	8.00
24. Furn., lay 6-in. underdrains	2,500 l. f.	.68	.55	.70
25. Furn., lay 8-in. underdrains	20 l. f.	.80	.70	.84
26. Earth excav. and refill below subgrade	5 c. y.	2.80	2.50	3.00

27. Gravel excav. and refill below subgrade	150 c. y.	5.40	4.00	7.00
28. Misc. Cl. B conc. masonry	5 c. y.	21.50	14.00	14.90
29. Misc. Cl. C conc. masonry	5 c. y.	20.00	12.00	14.00
30. Misc. Cl. D conc. masonry	5 c. y.	19.00	10.00	14.00
31. Sheeting and shoring	1 M bm.	40.00	35.00	68.00
32. Lumber in foundation	1 M bm.	47.00	60.00	80.00
33. Misc. and test pit excav. and refill, 0–6-ft.	5 c. y.	2.80	1.50	3.00
34. As above, 0–10-ft.	5 c. y.	4.20	2.00	3.60
35. As above, 0–10+-ft.	5 c. y	5.60	2.50	4.20

SEWERAGE SYSTEM WAYNESVILLE, MO.

OWNER: Defense Public Works Division of the Federal Works Agency, Kansas City, Mo. Russell & Axon, Inc., St. Louis, Mo., consulting engineers.

PROJECT: Construction of a sanitary sewage collection system in Waynesville, Mo. (Contract 2, Docket No. 23-110.) Involves furnishing and laying of 30,800 feet of vitrified clay pipe, all necessary cast iron pipe, manholes, all excavation and backfill, and construction of pumping station.

CONDITIONS: Contractor to furnish all materials and complete work in 100 calendar days. Highway transportation available to site of work. Wage rates are: skilled labor, $1.25 to $1.50 per hr.; semi-skilled, 65 to 85c.; common, 55c.

BIDS: Four bids were opened November 28, 1941, ranging from the contract low of $73,895 to $106,768.

LIST OF BIDDERS:

1. E. J. Fischer, St. Louis, Mo. (contract) $73,895
2. Samuel Kraus Co., St. Louis, Mo 80,163
3. R. W. Vaught, Camdenton, Mo 106,272

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 12-in. vitrified clay pipe	2,600 l. f.	$0.90	$0.75	$0.78
2. 10-in. vitrified clay pipe	8,200 l. f.	.80	.65	.65
3. 8-in. vitrified clay pipe	20,000 l. f.	.70	.50	.53
4. 10-in. cast iron pipe	375 l. f.	4.00	2.75	5.60
5. 8-in. cast iron pipe	100 l. f.	3.00	2.20	3.36
6. 6-in. cast iron pipe	200 l. f.	2.00	1.60	2.24
7. Cast iron specials	500 lb.	.10	.25	.22
8. 14-in. encasement	100 l. f.	10.00	2.00	----
9. Standard manholes, complete	117 ea.	75.00	100.00	154.56
10. Additional depth, manholes	280 l. f.	10.00	15.60	16.80
11. Drops for manholes	4 ea.	25.00	15.00	16.80
12. Standard lampholes, complete	6 ea.	40.00	32.00	22.40
13. Excav. and backfill, 0–6-ft. stage	12,800 c. y.	1.30	2.10	2.86
14. Excav. and backfill, 6–10-ft. stage	2,300 c. y.	1.40	2.20	5.87
15. Excav. and backfill, 10–14-ft. stage	500 c. y.	3.00	2.75	8.40
16. Excav. and backfill, 14–18-ft. stage	110 c. y.	3.00	5.00	12.32
17. Excav. and backfill, 18–22-ft. stage	15 c. y.	5.00	7.00	14.00
18. Rock excavation	225 c. y.	15.00	12.00	13.16
19. Concrete encasement	900 c. y.	2.00	1.00	1.49
20. 12x6-in. wyes and plugs	20 ea.	5.00	4.55	2.82
21. 10x6-in. wyes and plugs	110 ea.	4.00	2.80	1.64
22. 8x6-in. wyes and plugs	450 ea.	3.00	2.25	1.57
23. Pumping station, complete	L. S.	7,000.00	5,684.40	1,211.84

CLEARING AND GRADING AIRPORT, AJO, ARIZONA

OWNER: Civil Aeronautics Administration, U. S. Engineer Office, Los Angeles, Calif.

PROJECT: Clearing, grubbing, excavating, grading, fencing and construction of all drainage facilities at Ajo Municipal Airport, about five miles north of Ajo, Pima County, Ariz., on the Ajo-Gila Bend Highway. Fence to consist of barbed-bottom, woven wire field fencing, and two strands of barbed wire above woven wire, all supported by steel posts, certain of which shall be braced and set in concrete.

CONDITIONS: Contractor to furnish all materials and complete work in 60 days. Railroad and highway transportation facilities available. Wages prevailing in area will be paid.

BIDS: Six bids were opened March 10, 1941, ranging from the contract low of $57,306 to $72,068.

LIST OF BIDDERS:

1. Tiffany Constr. Co., Phoenix, Ariz. (contract) $57,306
2. L. D. Richardson & Co., Beverly Hills, Calif. 58,132
3. J. A. Casson Co., Hayward, Calif. 62,573
4. Nathan A. Moore, Moorpark, Calif. 64,783
5. Tanner Constr. Co., Phoenix, Ariz. 66,512
6. W. E. Callahan Constr. Co., and Gunther & Shirley Co., Los Angeles, Calif. 72,068

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	320 ac.	$10.00	$15.00	$18.00
2. Rough grading	127,800 c. y.	.17	.18	.20
3. Fine grading	585,700 s. y.	.034	.03	.03
4. Oiling landing areas	220 ton	17.00	18.00	18.00
5. 15-in. corr. metal pipe	310 l. f.	2.50	2.65	3.00
6. 18-in. corr. metal pipe	720 l. f.	3.00	3.00	3.25
7. 24-in. corr. metal pipe	184 l. f.	4.00	4.15	5.00
8. Catch basin	3 ea.	125.00	120.00	100.00
9. Fencing	20,600 l. f.	.20	.20	.22
10. Gate	2 ea.	30.00	21.00	50.00

AIRPORT PAVING AND DRAINAGE ENDICOTT, N. Y.

OWNER: Civil Aeronautics Administration, represented by the U. S. Engineer Office, Binghamton, N. Y.

PROJECT: Paving and drainage of the Tri-Cities Airport, located along right bank of Susquehanna River, about 3 miles west of Endicott, Broome County, N. Y. Involves construction of soil-cement base course; bituminous plant-mix top course; bituminous seal coat; runway shoulder treatment; drainage system; levee embankment and drainage structure; and top-soiling, sodding and seeding. Subgrade previously constructed under another contract.

CONDITIONS: Contractor to furnish all materials and complete work in 110 calendar days, without interference to other contractors on job. Highway and rail transportation facilities available near site of work. Minimum wages specified are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 65 to 90c.; and common, 62½c.

BIDS: Three bids were opened May 6, 1941, ranging from the contract low of $182,429 to $193,668. Engineer's estimate $194,523.

LIST OF BIDDERS:

1. Binghamton Constr. Co., Inc., Binghamton, N. Y. (contract) $182,429
2. D. W. Winkelman Co., Syracuse, N. Y. 183,944
3. Zara Contracting Co., Hewlett, L. I., N. Y. 193,668

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Borrow excavation	10,000 c.y.	$0.30	$0.45	$0.23
2. Topsoiling	2,050 c. y.	1.25	1.40	1.10
3. Sodding	5,800 s. y.	.50	.60	.50
4. Seeding	22,000 s. y.	.04	.06	.05
5. Dumped riprap	100 c. y.	5.00	4.50	12.00
6. Rock paving, grouted or un-grouted	400 c. y.	9.00	6.50	12.00
7. Concrete	60 c. y.	24.00	22.00	27.00
8. Reinforcing steel	5,200 lb.	.06	.06	.07
9. Constr. soil-cement base crse., runway	80,000 s. y.	.34	.34	.34
10. Cement for soil-cem. base crse	8,200 bbl.	2.80	2.70	2.70
11. Bitum. prime coat, runways (tar)	20,000 gal.	.11	.12	.12
12. Bitum. plant-mix top crse	6,600 ton	7.25	8.00	5.50
13. Aggregate, bitum. seal coat, runway	600 ton	2.25	1.75	2.25
14. Asphalt for bitum. seal coat	16,000 gal.	.09	.10	.10
15. Aggregate for bitum. trtmt., runway shoulders	930 ton	3.00	2.25	3.00
16. Tar for bitum. trtmt., runway should.	21,000 gal.	.11	.115	.10
17. Asphalt for bitum. trtmt., shoulders	18,000 gal.	.09	.10	.10
18. Catch basins, complete	53 ea.	175.00	120.00	180.00
19. 8-in. vit. clay or non-rein. conc. pipe drains, open joint	5,420 l. f.	2.50	2.60	4.08
20. 10-in. as above	2,630 l. f.	2.60	2.80	4.14
21. 12-in. as above	1,270 l. f.	2.80	3.10	4.22
22. 15-in. as above	1,050 l. f.	3.10	3.50	5.25
23. 18-in. as above	280 l. f.	3.60	3.70	6.27
24. 12-in. vit. clay or non-rein. conc. pipe drains, closed joint	180 l. f.	2.40	1.25	2.56
25. 15-in. as above	290 l. f.	2.70	1.55	3.27
26. 18-in. as above	680 l. f.	3.30	1.75	3.97
27. 15-in. corr. metal pipe drains	200 l. f.	5.50	2.85	4.60
28. 24-in. corr. metal pipe drains	32 l. f.	10.00	7.00	7.05
29. 48-in corr. metal pipe drains	150 l. f.	15.00	14.00	11.55
30. 8-in. rein. conc. pipe drains, open joint	1,690 l. f.	3.00	2.95	4.42
31. 15-in. as above	270 l. f.	3.65	3.80	5.65
32. 12-in. rein. conc. pipe drains, closed joint	300 l. f.	3.00	1.75	2.87
33. 15-in. as above	390 l. f.	3.50	2.00	3.67
34. Drainage outlet head walls	8 ea.	75.00	120.00	145.00
35. 12-in. automatic drainage gates	1 ea.	35.00	30.00	22.00
36. 15-in. automatic drainage gates	4 ea.	40.00	45.00	26.00
37. 18-in. automatic drainage gates	2 ea.	60.00	60.00	37.00
38. Wrt. iron pipe handrail	56 l. f.	3.00	5.00	3.00
39. Comb. automatic and slide gates, 48-in.	3 ea.	400.00	500.00	308.00
40. Corrugated metal seep rings	2 ea.	400.00	300.00	300.00
41. Levee embankment	6,000 c. y.	.30	.26	.54

RUNWAY AND TAXIWAY PAVING BOEING FIELD, WASH.

OWNER: Civil Aeronautics Administration, represented by the U. S. Engineer Office, Seattle, Wash.

PROJECT: Paving NNW/SSE runway, grading and paving taxiway and installing drainage at King County Airport (Boeing Field), Seattle, Wash. The major features are: grading; sub-base preparation; concrete runway pavement; bituminous taxiway paving; and drainage system.

CONDITIONS: Contractor to furnish all materials and complete work in 100 calendar days. Highway and railroad transportation facilities available. Wage rates are: skilled labor, $1.35 to $1.75 per hr.; semi-skilled, $1.10 to $1.40; and common labor, 95c.

BIDS: Three bids were opened May 26, 1941, ranging from the low of $239,520 to $258,083. Engineer's estimate $255,844.

LIST OF BIDDERS:

1. Northwest Constr. Co., Seattle, Wash. $239,520
2. Fiorito Bros., Inc., Seattle, Wash. 252,828
3. N. Fiorito Co., Seattle, Wash. 258,083

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Grading NW/SE runway	31,000 s. y.	$0.15	$0.05	$0.10
2. Grading taxiway	21,600 s. y.	.10	.05	.10
3. Preparation NNW/SSE runway sub-base	132,000 s. y.	.05	.05	.05
4. Crushed rock in place	3,500 c. y.	2.00	2.15	2.50
5. Gravel ballast course, in place	9,000 c. y.	1.00	.75	1.10
6. Bitum. binder crse. RC-3, in place	26 ton	25.00	17.50	18.50
7. Dense graded plant mix, in place	2,300 ton	5.50	4.00	4.00
8. Asphaltic-cement, 121–150	150 ton	25.00	19.00	20.00
9. Asphaltic-cement, 86–100	10 ton	25.00	19.00	20.00
10. Bitum. sealcoat, RC-2	26 ton	30.00	23.00	24.00
11. Screenings	185 ton	2.00	3.10	3.50
12. Concrete runway pavement	128,000 s. y.	1.37	1.44	1.55
13. Excavation for drains	500 c. y.	1.50	1.50	1.00
14. Selected bkfill. for drains	350 c. y.	3.00	3.00	3.00
15. 8-in. conc. culvert pipe	4,000 l. f.	.40	.50	.40
16. Catch basins	50 ea.	15.00	30.00	20.00
17. Grates and covers	50 ea.	23.00	20.00	20.00
18. Raise manholes	20 ea.	15.00	15.00	20.00
19. Concrete gutter	7,200 l. f.	1.10	3.00	1.10
20. Asphaltic drain gutter	700 l. f.	.40	.48	.50
21. Move contact lights	50 ea.	50.00	52.00	24.00

RUNWAYS AND TAXIWAYS MUROC BOMBING RANGE, CALIF.

OWNER: U. S. Engineer Office, Los Angeles, Calif.

PROJECT: Construction of runways, taxiways, aprons and appurtenant facilities at Muroc Bombing Range, near Muroc Lake, Kern County, Calif., approximately 30 miles northeast of Lancaster. Involves improvement of area about 365,000 sq.yd., and includes all excavation, filling, grading, paving, drainage facilities and other miscellaneous work.

CONDITIONS: Contractor to furnish all materials and complete work in 120 calendar days. Railroad siding at site, and highway transportation facilities available. Wage rates are: skilled labor, $1.50 per hr.; semi-skilled, $1.25; and common, 72c.

BIDS: Four bids were opened June 30, 1941, ranging from the contract low of $1,300,404 to $1,683,960.

LIST OF BIDDERS:

1. James L. Ferry; E. P. Ferry; Sander Pearson; and Haines Canyon Materials Co., Glendale, Calif. $1,300,404
2. Bressi & Bevanda Constructors, Los Angeles, Calif. 1,339,058
3. Basich Bros. and Oswald Bros., Torrance, Calif. 1,485,581
4. Charles L. Harney, San Francisco, Calif. 1,683,960

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	240 ac.	$20.00	$15.00	$100.00
2. Rough grading	240,000 c.y.	.30	.30	.45
3. Fine grading	382,000 c.y.	.05	.04	.04
4. 6-in. grav. base for conc. paving	422,600 s.y.	.32	.40	.77
5. 9-6-9-in. concrete pavement	418,800 s.y.	2.26	2.35	2.13
6. Tie-down anchor, complete	2,365 ea.	2.75	1.50	1.40
7. 21-in. rein. concrete pipe	4,550 l.f.	5.50	4.00	4.00
8. 15-in. corr. met. pipe sleeve	420 l.f.	3.75	3.00	3.50
9. 18-in. corr. met. pipe sleeve	130 l.f.	4.00	3.50	3.50
10. Catch basin, type A	12 ea.	150.00	200.00	200.00
11. Catch basin, type B	1 ea.	300.00	300.00	400.00
12. Conc. in misc. structures	95 c.y.	40.00	20.00	30.00
13. Conc. backfill, class C	940 c.y.	25.00	13.00	15.00
14. 8-in. cast iron pipe	5,080 l.f.	3.00	2.75	3.50
15. 6-in. cast iron pipe	230 l.f.	2.50	2.00	3.00
16. 2-in. cast iron pipe	5,120 l.f.	1.50	1.00	2.00
17. 8-in. gate valve	4 ea.	60.00	75.00	75.00
18. 6-in. gate valve	23 ea.	45.00	50.00	50.00
19. 2-in. gate valve	24 ea.	20.00	30.00	16.00
20. Flushing hydrant	24 ea.	50.00	45.00	60.00
21. Fire hydrant	23 ea.	125.00	150.00	150.00
22. Concrete vault	2 ea.	1,000.00	1,350.00	2,000.00
23. Conc. encased single duct, 3-in	4,200 l.f.	1.50	1.00	1.25
24. Conc. encased 2-duct bank, 3-in.	700 l.f.	2.25	1.60	2.00
25. Conc. encased 3-duct bank, 4-in.	840 l.f.	2.50	2.00	3.50
26. Conc. encased 4-duct bank, 4-in.	140 l.f.	4.00	3.00	6.00
27. Conc. encased 8-duct bank, 4-in.	310 l.f.	6.00	7.00	12.50
28. Conc. encased 16-duct bank, 4-in.	330 l.f.	10.00	12.00	21.00
29. Junction and receptacle unit	23 ea.	200.00	175.00	300.00
30. Misc. elect. equip. and wiring	L.S.	8,000.00	8,000.00	10,000.00
31. 10-in. gate valve	1 ea.	140.00	150.00	100.00

CHEMUNG COUNTY AIRPORT NEW YORK

OWNER: Civil Aeronautics Administration, First Region, LaGuardia Field, New York, N. Y.

PROJECT: Construction of Class 3 airport at Chemung County, New York, Airport, consisting of grading, draining, paving and lighting of airport, which includes three landing strips 500-ft. wide by 4,000-ft. long, and taxiways. Also includes complete dismantling, relocation or removal of existing structures and facilities at present intermediate field at the same location. Drainage, in general, consists of longitudinal pipe drains placed parallel to runways and drainage ditches bordering landing strips, and open drainage ditches with outlets into other ditches or natural water courses. Paving of runways on landing strips to be performed under another contract, as all bids for Schedule III (Paving) in these specifications were rejected and new bids asked March 11, 1942.

CONDITIONS: Contractor to furnish all materials under Schedule I and II; government to furnish the following material for Airport Lighting (Sched. IV): beacon tower and lightning arrestor; windcone assembly; cabinets; rotating beacon; airport series boundary, range and contact light units; wind tee unit; obstruction light fittings; astromomic clock; parkway cable; splice boxes; electric lamps; film cutouts; windcone assembly, externally lighted; and lattice masts. Rail and highway transportation facilities available near site of work. Wage rate minimums are: skilled labor, $1.00 to $1.50; semi-skilled, 55c. to $1.00; and common, 62½c. per hr.

BIDS: Seven bids were received January 2, 1942 for Schedule I (Clearing), ranging from $7,963 to $37,800. Contract awarded to second low bidder at $13,100. On Schedule II (grading, drainage, seeding) eleven bids were received, ranging from the contract low of $176,217 to $358,353. All bids were rejected on Schedule III (paving). On Schedule IV (Airport Lighting) five bids were received ranging from the contract low of $21,287 to $36,948.

Schedule I—Clearing Site

LIST OF BIDDERS: Time for completion, 45 days.

1. Sunswick Bldg. Corp., Long Island, N. Y. $7,963
2. Grandview Nurseries, Mt. Vernon, N. Y. (contract) 13,100
3. Dalrymple Gravel and Cont'g. Co., Elmira, N. Y. 13,854
4. Tomack Subsidiary Inc., Rochester, N. Y. 18,175
5. O'Brien-Fortin, Inc., and Delmar Engr. Corp., New York, N. Y. 19,550
6. D. W. Winkleman Co., Syracuse, N. Y. 24,310
7. N. R. Corbisello, Binghamton, N. Y. 37,800

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear and remove structures	L. S.	$1,167.00	$5,350.00	$4,300.00
2. Dismantle exist. intermediate field	L. S.	3,734.00	2,600.00	5,365.00
3. Move, re-erect Airway Keeper's house	L. S.	2,607.00	4,350.00	3,660.00
4. Drill well, water supply system	40 l.f.	2.04	5.00	2.035
5. Install casing, water supply system	40 l.f.	1.75	2.50	1.485
6. Install screen, water supply system	L. S.	17.50	160.00	178.20
7. Constr. well pit, install pump, make elec. connections	L. S.	286.00	340.00	210.00

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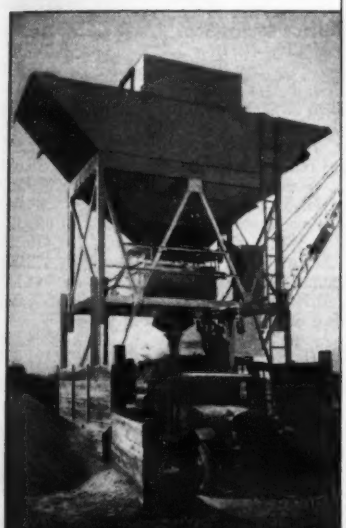

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- PORTABLE BULK CEMENT PLANTS FROM 100 TO 700 BBLS. CAPACITY
- COMBINATION AGGREGATE & CEMENT PLANTS FROM 100 TONS CAPACITY
- STANDARD PERMANENT AGGREGATE PLANTS TO 400 TONS CAPACITY
- STANDARD PERMANENT BULK CEMENT PLANTS TO 1500 BBLS. CAPACITY

Schedule II—Grading, Drainage, Seeding

LIST OF BIDDERS: Time for completion, 100 days.

1. Grandview Nurseries, Mt. Vernon, N. Y. (contract) $176,217
2. Sunswick Bldg. Corp., Long Island City, N. Y. 179,891
3. Lindholm Constr. Co., Inc., Pittsfield, Mass. 208,052
4. D. W. Winkleman Co., Syracuse, N. Y. 227,847
5. Tomack Subsidiary, Inc., Rochester, N. Y. 253,940
6. O'Brien-Fortin, Inc., and Delmar Engr. Corp., New York, N. Y. 259,376
7. Binghamton Constr. Co., Binghamton, N. Y. 267,883
8. John Arborio, Poughkeepsie, N. Y. $268,628
9. C. E. Knowles, Inc., Gowanda, N. Y. 288,274
10. Dalrymple Gravel & Cont'g. Co., Elmira, N. Y. 289,124
11. N. R. Corbisello, Binghamton, N. Y. 358,353

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Earth excavation	170,000 c. y.	$0.25	$0.235	$0.30
2. 6-in. I. D. pipe with porous bkfill., runway drainage	4,050 l. f.	1.60	1.60	2.00
3. 8-in., as above	5,657 l. f.	1.70	1.68	2.10
4. 10-in., as above	4,484 l. f.	1.85	1.95	2.90
5. 12-in., as above	4,681 l. f.	2.50	2.60	3.60
6. 15-in., as above	1,062 l. f.	2.90	3.17	4.40
7. 18-in., as above	3,799 l. f.	3.73	3.70	5.10
8. 21-in., as above	1,247 l. f.	4.37	4.17	5.70
9. 30-in., as above	629 l. f.	7.06	6.82	10.50
10. 8-in. pipe for runway culverts	250 l. f.	2.50	2.34	3.00
11. 12-in. pipe for runway culverts	300 l. f.	2.00	1.69	2.70
12. 15-in. pipe for runway culverts	1,034 l. f.	2.35	2.13	3.15
13. 18-in. pipe for runway culverts	300 l. f.	2.90	2.63	4.30
14. 21-in. pipe for runway culverts	731 l. f.	3.75	3.21	4.90
15. 24-in. pipe for runway culverts	245 l. f.	4.70	3.86	6.00
16. 30-in. pipe for runway culverts	1,598 l. f.	6.50	6.11	8.75
17. 42-in. pipe for runway culverts	24 l. f.	12.00	9.46	15.00
18. Seeding	200 ac.	135.00	152.00	90.00
19. Commercial fertilizer	100 ton	45.00	39.00	60.00
20. Agricultural hydrated lime	100 ton	14.00	30.00	15.00
21. Catch basins, 2x2-ft. inside, and overall outside height 4½ to 5½ ft	43 ea.	110.00	122.00	90.00
22. Catch basins, 2x2-ft. inside dimen. and overall outside ht. 5½ to 6½ ft	25 ea.	121.00	129.00	100.00
23. As above, overall out. ht. 6½ to 7½ ft	3 ea.	132.00	152.00	115.00
24. Catch basins, 3¾x3¾ ft. I. D. and overall outside ht. 5½ to 7½ ft	15 ea.	182.00	164.00	200.00
25. Earth excav. for drain. sys. outfall to Sing Sing Creek	9,675 c. y.	.55	.59	.50
26. 3-in. fiber duct furn. and installed in single runs	6,285 l. f.	.35	.68	.60

Schedule IV—Airport Lighting

LIST OF BIDDERS: Time for completion, 120 days.

1. Elco Installation, Inc., New York, N. Y. (contract) (a) $21,821 (b) 21,287
2. O'Connell Electric Co., Rochester, N. Y. (a) 24,744 (b) 24,818
3. Sunswick Bldg. Corp., Long Island City, N. Y. (a) 26,965 (b) 27,189
4. Tomack Subsidiary, Inc., Rochester, N. Y. (a) 27,945 (b) 28,269
5. O'Brien-Fortin, Inc., and Delmar Engr. Corp. New York, N. Y. (a) 36,808 (b) 36,948

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Concrete transformer vault	L. S.	$2,958.00	$2,150.00	$3,600.00
2. Excavating trench, 18-in. deep	50,000 l. f.	.10	.20	.045
3. Excavating trench, 36-in. deep	3,500 l. f.	.15	.30	.11
4. Inst. series disconnecting boundary or range lights, cone type	73 units	18.00	15.00	39.20
5. Inst. 51-ft. beacon tower and 36-in. beacon	L. S.	610.00	325.00	448.00
6. Install wind tee unit	L. S.	306.00	180.00	448.00
7. Obstruction lights, incl. 25-ft. pole	1 ea.	139.00	40.00	84.00
8. Obstruction lights, incl. 35-ft. pole	1 ea.	149.00	50.00	95.00
9. Obstruction lights, incl. 45-ft. pole	1 ea.	181.00	60.00	112.00
10. Obstruction lights, incl. 55-ft. pole	1 ea.	195.00	70.00	129.00
11. 78-ft. mast	1 ea.	56.00	50.00	252.00
12. 87-ft. mast	1 ea.	70.00	60.00	275.00
13. 108-ft. mast	1 ea.	98.00	75.00	330.00
14. Inst. 36-in. externally lighted wind cone	L. S.	86.00	100.00	112.00
15. Concrete, 1:2:4 mix	1 c. y.	12.00	20.00	22.50
16. Reinforcing steel	100 lb.	.07	.08	.17
17. 2-in. galvanized conduit	20 l. f.	.40	.50	.65
18. Inst. series flush type contact light units adjacent to french drain	100 units	29.80	25.00	50.40
19. Inst. series flush type contact lights within runway	16 units	29.40	50.00	50.40
20. Inst. control panel in transformer vault (Alternate A)	L. S.	1,472.00	876.00	2,240.00
21. Control panel installation in Control Bldg. (Alternate B)	L. S.	938.00	950.00	2,464.00
22. Inst. equip. for operating contact lights	L. S.	962.00	1,635.00	1,244.00
23. Terra cotta duct	400 l. f.	2.75	2.00	2.24
24. Series disconnecting boundary or range lights, flush type	6 units	23.00	15.00	39.20
25. Inst. cable in 18 or 36-in. trenches	50,000 l. f.	.04	.03	.0675
26. Inst. cable in fiber duct, conduit, or terra cotta duct	7,000 l. f.	.05	.05	.09
27. Inst. obstruct. lights on exist. poles or struct.	10 ea.	24.50	35.00	84.00
28. Inst. 750-watt series to multiple isolating transformer	5 ea.	78.00	100.00	44.80

AIRPORT DRAINAGE
MORRISTOWN, N. J.

OWNER: U. S. Engineer Office, New York, N. Y., functioning as deputy contracting officer for Civil Aeronautics Administration.

PROJECT: All work required for the first stage of construction of Morristown, N. J., airport. Involves clearing and grubbing, general excavation, stockpiling topsoil, placing random embankment, and settling embankment by blasting; placing selected pervious embankment and humus on top, shoulders and slopes of random fill embankment; and excavating drainage ditches and placing culvert pipe and manholes.

CONDITIONS: Contractor to furnish all materials and complete work in 90 days. Highway and railroad transportation facilities available. Wage minimums specified are: skilled labor, $1.25 to $2.00 per hr.; semi-skilled, $1.00 to $1.25; and common, $1.00.

BIDS: Eighteen bids were opened March 20, 1941, ranging from the contract low of $265,872 to $1,121,657. Engineer's estimate, $264,268.

LIST OF BIDDERS:

1. Joseph L. Sigretto & Sons, Inc., Carlstadt, N. J. (contract) $265,872
2. N. D. Maselli Corp., Bloomfield, Conn. 266,885
3. Santaniello Bros., Jersey City, N. J. 313,152
4. United Crane & Shovel Service Co., Newark, N. J. 316,944
5. George M. Brewster & Son, Inc., Bogota, N. J. 358,016
6. S. J. Groves & Sons Co., Ridgefield, N. J. 360,714
7. Tully & Di Napoli, Inc., Long Island City, N. Y. 361,000
8. J. P. Burns, Dumont, N. J. 372,580
9. Franklin Contracting Co., Newark, N. J. 375,684
10. Villa Contracting Co., Westfield, N. J. 379,969
11. M. J. Roth, Flushing, N. Y. 384,640
12. Hendrickson Bros., Valley Stream, N. Y. 398,127
13. Circle Construction Co., White Plains, N. Y. 410,256
14. Andrew Gull Corp., New York, N. Y. 422,007
15. B. Perini & Sons, Inc., Framingham, Mass. 544,111
16. Frank Mashuda Co., Milwaukee, Wis. 555,000
17. Welch Bros. Contracting Co., Inc., Long Island City, N. Y. 594,100
18. Anthony Grasso, Newark, N. J. 1,121,657

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	L.S.	$9,000.00	$40,000.00	$10,000.00
2. Excavation, topsoil	55,000 c. y.	.21	.18	.20
3. Excavation, common	144,000 c. y.	.21	.18	.20
4. Embankment, random	750,000 c. y.	.21	.16	.24
5. Embankment, selected pervious	77,300 c. y.	.24	.30	.30
6. Embankment, blending gravel (optional)	10,000 c. y.	.35	.35	.30
7. Dynamite for embankment, settlement (optional)	50,000 lb.	.30	.10	.15
8. Remove, reset structures	L.S.	1,200.00	15,000.00	800.00
9. Embankment, humus	329,000 s. y.	.04	.035	.10
10. Drainage ditches	19,600 l. f.	.20	.35	.72
11. Culvert pipe and manholes	L.S.	2,250.00	6,000.00	1,850.00

AIRPORT IMPROVEMENT
FARGO, N. D.

OWNER: U. S. Engineer Office, St. Paul, Minn., for Civil Aeronautics Administration.

PROJECT: Improvement of Fargo Municipal Airport about one mile northwest of Fargo, N. D., on U. S. Highway 81. Includes construction and paving of runways, concrete apron, drainage, and appurtenant work. Runways to be built are northwest-southeast, and north-south units, each 5,000-ft. long, consisting of base courses of compacted moisture controlled stabilized fill; 300-ft. wide at base; and a 6-in. soil-

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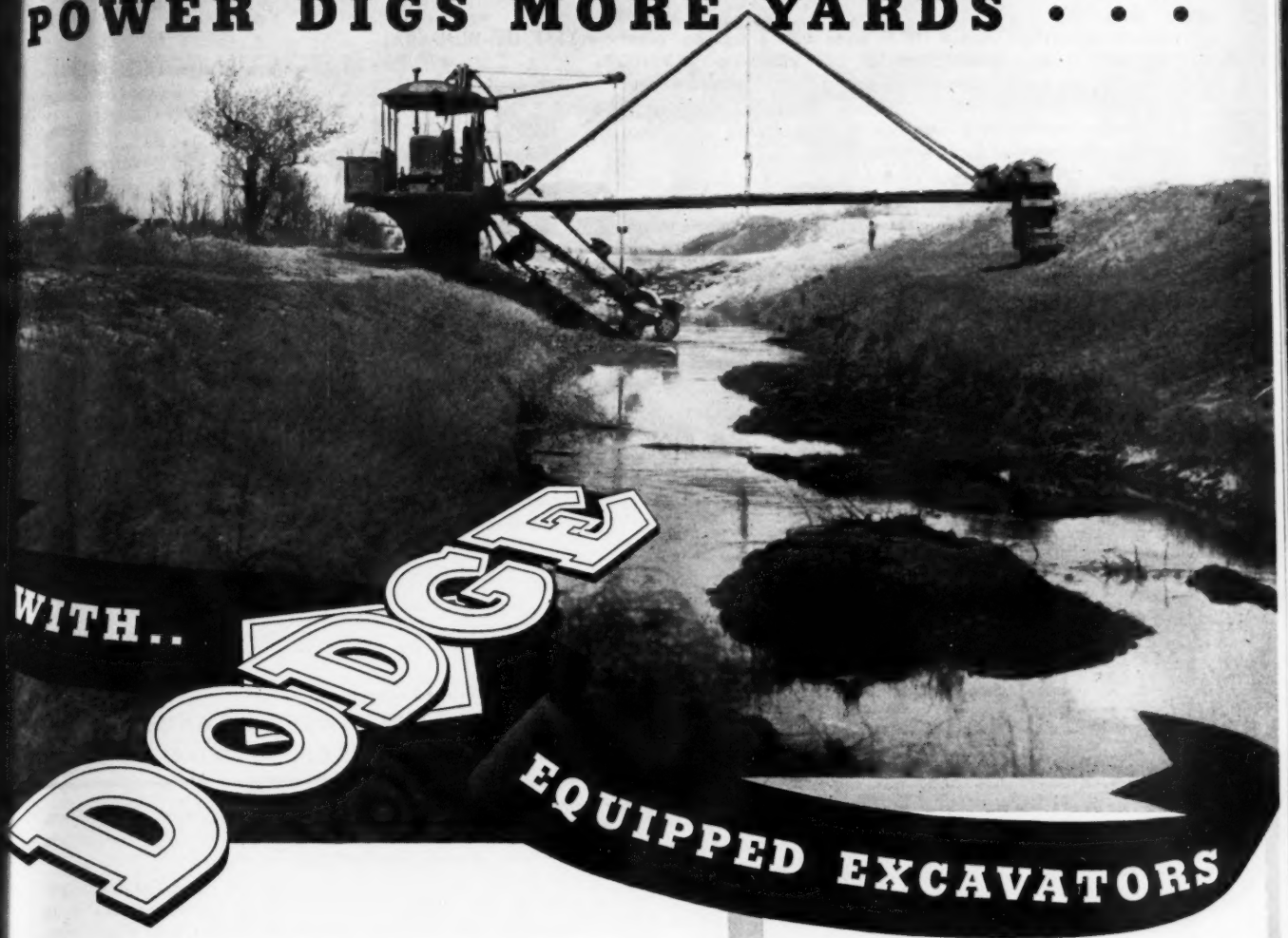

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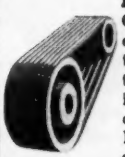

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cement subsurface course 100-ft. wide with a semi-hot plant mix bituminous surface course of 1-in. minimum thickness. Concrete apron consists of 6-in. concrete pavement over compacted moisture controlled stabilized gravel base course. Drainage consists of airport type surface drains, subsurface drains, manholes and catch-basins.

CONDITIONS: Contractor to furnish all materials and complete work in 170 calendar days. Airport now in operation and will be in use continuously during construction period. Portions of new runways will be opened to airplane traffic upon completion of soil-cement course before application of bituminous surfacing. Highway facilities available, but due to congestion of traffic, routes to be used will be subject to approval of city, county or state agencies. Wage rates specified are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 60c. to $1.00; and common, 60c.

BIDS: Ten bids were opened April 24, 1941, ranging from the contract low of $311,200 to $606,007.

LIST OF BIDDERS:

1. McCree & Co., St. Paul, Minn. (contract) $311,200
2. S. J. Groves & Sons Co., Minneapolis, Minn. 325,544
3. McKenzie Brothers, Minneapolis, Minn. 336,964
4. Northwestern Engineering Co., Rapid City, S. D. 383,914
5. Northern Improvement Co., Fargo, N. D. 426,776
6. Albert Lalonde Co., Sidney, Mont. 444,141
7. Haggart Constr. Co., Fargo, N. D., and W. H. Noel Co., Jamestown, N. D. 512,667
8. Megarry Bros., St. Cloud, Minn. 547,426
9. S. Birch & Sons Constr. Co., Fargo, N. D. 592,753
10. Jay W. Craig Co., Minneapolis, Minn. 606,007

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	28,900 c. y.	$0.35	$0.40	$0.60
2. Fill; earth	3,500 c. y.	.10	.10	.06
3. Sub-base compaction	13,330 c. y.	.10	.10	.10
4. Base course, Lift A	104,160 c. y.	1.00	1.10	1.15
5. Base course, Lift B	37,820 c. y.	1.20	1.25	1.25
6. Base course, soil-cement	19,100 c. y.	1.80	1.90	1.40
7. Cement, for soil-cement	10,320 bbl.	3.00	2.61	2.68
8. Prime coat, bituminous	68,970 gal.	.115	.10	.12
9. Wearing course	5,730 ton	3.45	4.00	6.00
10. Seal coat; bituminous	22,910 gal.	.09	.10	.12
11. Seal coat; cover aggregate	470 c. y.	1.78	2.00	.90
12. Pavement; concrete	4,560 s. y.	4.50	2.49	2.50
13. 8-in. corr. met. pipe; excav., bkfill	160 l. f.	1.10	2.00	1.25
14. 10-in. corr. met. pipe; excav., bkfill	420 l. f.	1.50	2.10	1.35
15. 12-in. corr. met. pipe; excav., bkfill	400 l. f.	1.60	2.20	1.50
16. 15-in. corr. met. pipe; excav., bkfill	330 l. f.	1.85	2.50	1.80
17. 18-in. corr. met. pipe; excav., bkfill	900 l. f.	2.30	3.00	1.90
18. 8-in. surf. drains; incl. c.m. pipe, excav. and backfill	6,150 l. f.	1.50	2.00	2.00
19. 10-in., as above	3,440 l. f.	1.65	2.00	2.20
20. 12-in., as above	1,270 l. f.	2.00	2.25	2.30
21. 18-in., as above	180 l. f.	2.70	3.00	2.95
22. 21-in., as above	430 l. f.	3.00	3.25	3.30
23. Corr. met. pipe perf., subsurf. drains	330 l. f.	3.00	2.20	1.95
24. Vitr. clay tile subsurface drains	1,520 l. f.	.75	2.00	.90
25. Electrical conduit	3,935 l. f.	1.20	.95	.85
26. Additions to existing drains	8,060 l. f.	.20	.60	.50
27. Manholes and catch basins	L.S.	1,591.95	900.00	1,600.00

AIRPORT PAVING
HOUSTON, TEXAS

OWNER: U. S. Engineer Office, Galveston, Tex.

PROJECT: Paving two runways and one taxi-way, including clearing, grading, drainage and other incidental work at Houston Municipal Airport on Houston-Alvin Highway, 8 miles southeast of main section of Houston. Portions of existing shell runways crossed by proposed concrete pavement to be excavated, and shell reclaimed and stockpiled. This reclaimed shell, and new shell needed, to be placed in uniform layer on approved stabilized course over entire area to be paved.

CONDITIONS: Contractor to furnish all materials and complete work in 180 calendar days. To obtain sufficient water, contractor must place and maintain own water line to source of supply, or furnish water by making other arrangements. Highway transportation facilities available. Wage rates specified are: skilled labor, $1.12½ to $1.50 per hr.; semi-skilled, 40c. to $1.00; and common labor, 40c.

BIDS: Nine bids were received May 5, 1941, ranging from the low of $348,882 to $407,428. Engineer's estimate, $434,888.

LIST OF BIDDERS:

1. Russ Mitchell, Inc., Houston, Tex. (contract) $348,882
2. George Kies, Inc., Austin, Tex 349,028
3. Cage Bros. & H. E. Williams, Bishop, Tex 367,288
4. L. H. Lacy Co., Dallas, Tex 370,896
5. Harrison Engr. & Constr. Co., Kansas City, Mo 392,094
6. Briggs-Killian Co., Inc., San Antonio, Tex. 393,146
7. Gaylord Constr. Co., Houston, Tex 393,370
8. Brown & Root, Inc., Houston, Tex 397,879
9. T. L. James & Co., Ruston, La 407,428

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	117,600 c. y.	$0.24	$0.25	$0.32
2. Shell; reclaimed	25,000 c. y.	.38	.40	.45
3. Shell; new (all required)	..... c. y.	3.00	1.80	1.73
4. 15-in. corr. met. pipe; remov. exist. pipe, incl. earthwk	800 l. f.	.45	.30	.44
5. 18-in., as above	1,850 l. f.	.50	.30	.48
6. 24-in., as above	2,710 l. f.	.55	.35	.65
7. 30-in., as above	3,460 l. f.	.65	.50	.78
8. Relay 15-in. corr. met. pipe, reclaimed; incl. earthwork	600 l. f.	.55	.30	.51
9. 18-in. pipe, as above	1,730 l. f.	.60	.30	.64
10. 24-in. pipe, as above	2,505 l. f.	.70	.35	.87
11. 30-in. pipe, as above	3,285 l. f.	.85	.50	1.10
12. 36-in. bit. coat. corr. met. pipe	1,000 l. f.	6.50	7.00	6.85
13. 42-in. bit. coat. corr. met. pipe	2,250 l. f.	7.60	8.00	8.20
14. 15-in. bit. coat. corr. met. pipe; as needed for rejected exist. pipe	..... l. f.	2.00	2.30	2.20
15. 18-in. pipe, as above	..... l. f.	2.40	2.60	2.80
16. 24-in. pipe, as above	..... l. f.	3.60	3.60	3.90
17. 30-in. pipe, as above	..... l. f.	4.50	4.80	4.85
18. 8-in. conc. pipe, open joint	17,700 l. f.	.70	1.36	.58
19. 8-in. conc. pipe, closed joint	1,910 l. f.	.50	.47	.62
20. Remove existing inlets	12 ea.	10.00	40.00	10.00
21. Concrete inlets	12 ea.	60.00	100.00	55.00
22. Prefabricated inlet fittings	5 ea.	200.00	200.00	175.00
23. Concrete pavement	151,900 s. y.	1.70	1.63	1.59
24. Remove exist. airport lights	L.S.	300.00	200.00	500.00
25. Conduit, fiber, bituminized	4,150 l. f.	.70	.60	.40

MOVING TARGET RANGE
LAS VEGAS, NEVADA

OWNER: War Department, Army Air Corps, Washington, D. C.; U. S. Engineer Office, Los Angeles, Calif. Col. Edwin C. Kelton, District Engineer.

PROJECT: Constructing moving target ranges and appurtenant facilities within the Government Reservation at Sheep Mountain Area, north of Las Vegas Airport, Las Vegas, Nev. Includes all necessary excavation, filling and grading; concrete work; laying track; surfacing and paving; and other miscellaneous items of work.

CONDITIONS: Government to furnish rails and rail accessories, new ties, anti-creepers, guard rail posts complete, gauge rods, target cars, car stopping devices, and gun mounts. Contractor to furnish all other material, and complete all work in 60 calendar days. Railroad and transportation facilities available. Wage rates are: $1.25 to $1.50 per hr.; semi-skilled, 62½c. to $1.00; and common labor, 62½c.

BIDS: Seven bids were opened November 17, 1941, ranging from the contract low of $89,968 to $122,548.

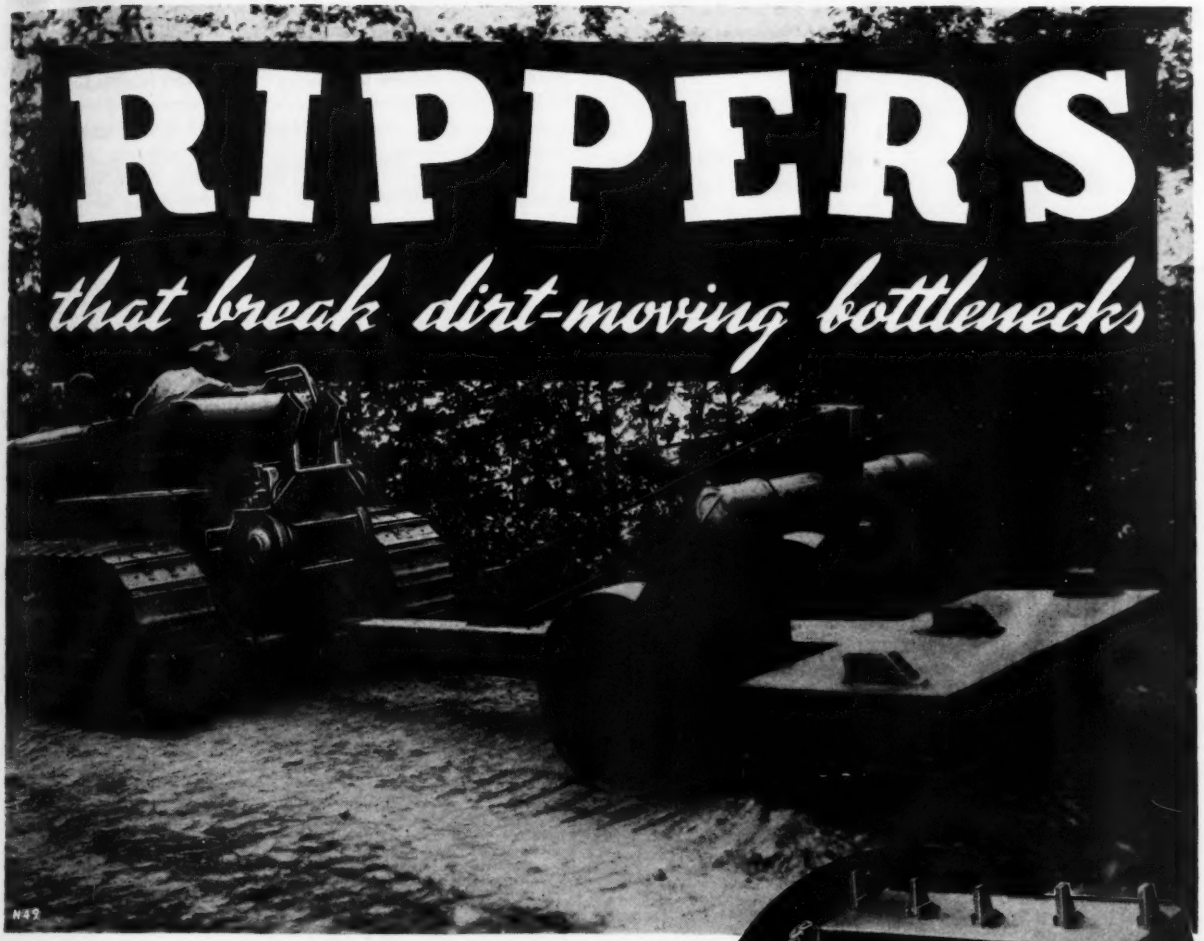
LIST OF BIDDERS:

1. Gibbons & Reed Co., Salt Lake City, Utah $89,968
2. Dodge Constr., Inc., Fallon, Nev 96,591
3. Clifford C. Bong, Temple City, Calif 97,206
4. W. R. Shriver, Glendale, Calif 110,686
5. H. B. Nicholson, Los Angeles, Calif. 115,754
6. Ralph O. Dixson, Glendale, Calif 116,826
7. Werner & Webb, Los Angeles, Calif 122,548

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Grading	54,000 c. y.	$0.35	$0.35	$0.23
2. Construct drainage ditches	14,000 l. f.	.15	.10	.23
3. Furn. and place ballast, and place track furn. by govt	21,800 l. f.	.70	.90	1.707
4. Place guard rails with posts and braces, furn. by govt	4,800 l. f.	2.55	2.50	1.29
5. Concrete for guard rail footings	1,536 c. y.	20.00	22.00	18.96
6. Asphalt paving on firing line	920 s. y.	1.45	1.00	.85
7. Embankment surface treatment	64,440 s. y.	.10	.09	.09
8. Place gun mounts furn. by govt	20 ea.	35.00	80.00	28.40
9. Install car-stopping devices furn. by govt., and furn. and inst. pipe, wire, and levers	5 ea.	250.00	500.00	193.00
10. 18-in. corr. metal culverts	60 l. f.	5.00	3.00	4.40
11. 24-in. corr. metal culverts	120 l. f.	6.00	4.00	5.50

RIPPERS

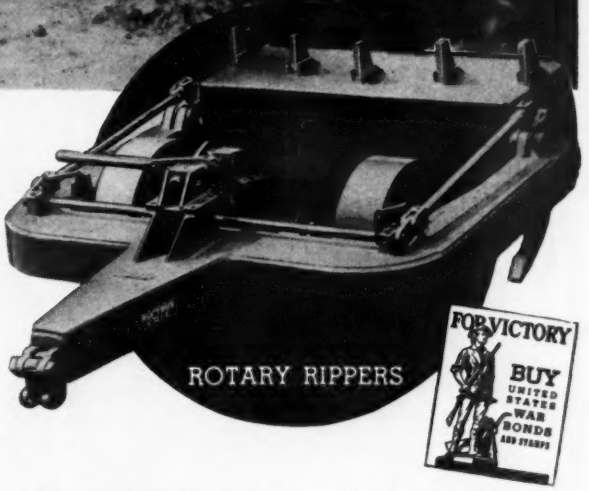
that break dirt-moving bottlenecks



Save time on those rush war dirt-moving jobs by using Bucyrus-Erie Rippers to break up the tough-digging, hard-loading materials. Breaking up the material — shale, hardpan, decomposed granite, sandstone, old macadam, etc. — will enable scrapers to load easier, faster, and get fuller loads. In some cases, expensive drilling or blasting can be eliminated.

CABLE RIPPERS — Quick, accurate control of digging depth is provided by a cable, operated from the tractor winch. Can be used with one, two, or three teeth. Standards can penetrate full length below ground — 17 inches on Model CR-1 and 24 inches on Model CR-2. Self-sharpening points of heat-treated alloy steel are easily replaced. Powerful breaking action; fast powerful lift.

ROTARY RIPPERS — Particularly handy for "odd-job" ripping because no power hook-up is needed. All you have to do is connect to the drawbar and go to work.



The self-cleaning rotation of the head swings the teeth in a complete revolution that help roll out rocks and other obstacles. Any combination of teeth, one to five to fit your work. Replaceable slip-on points protect teeth. — BUCYRUS-ERIE COMPANY, South Milwaukee, Wisconsin.

BUCYRUS ERIE
TRACTOR EQUIPMENT

SEE YOUR
INTERNATIONAL TRACTRACTOR
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EXCAVATION, CONCRETE INVERT CONTINENTAL DIVIDE TUNNEL

OWNER: Bureau of Reclamation, Denver, Colo.; S. O. Harper, chief engineer.

PROJECT: Excavation of the Continental Divide Tunnel from Sta. 72+00 to Sta. 152+00, and the placing of the concrete invert of the tunnel from Sta. 6+00 to Sta. 148+00, Colorado-Big Thompson project, Colorado. Placing of concrete invert begins at West Portal of tunnel, and extends about 2.7 miles in a northeasterly direction.

CONDITIONS: Government to furnish cement, powdered admixture, calcium chloride, drain tile, tar paper, pipe and fittings for permanent installations in connection with grouting and weep pipes, permanent steel tunnel supports, steel tunnel-liner plates, timber ties, timber decking, anchor bolts, anchor bolt sleeves, and nails for elevated track, all permanent ventilating and drainage pipes. Contractor to furnish sand, form materials, wire, wire ties, temporary supports, water, permanent timbering, spikes, drift pins, dowels, timbering used for filling spaces outside of permanent timber lagging, washed gravel and spalls, material for tamped fills, gravel or broken rock, calking materials, sawdust for grouting operation, and all other material not part of completed construction work. Time for completion is 500 calendar days. Rail and highway transportation facilities available to vicinity of work, but access roads to actual site to be provided by contractor.

BIDS: Four bids were opened June 5, 1941, ranging from the low of $832,906 to $991,088.

LIST OF BIDDERS:

1. Stiers Bros. Constr. Co., St. Louis, Mo. $832,906
2. Platt Rogers, Inc., Pueblo, Colo 952,280
3. Ed. H. Honnen Constr. Co., Colorado Springs, Colo. .. 964,460
4. J. N. Gordon and Dale Hinman, Denver, Colo 991,088

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, all classes, tunnel	40,000 c. y.	$13.00	$16.00	$16.30
2. Excav., all classes, sumps and recesses in tunnel	50 c. y.	15.00	40.00	20.00
3. Excav., all classes, tun. enlargement	1,000 c. y.	15.00	30.00	18.00
4. Excav., strip. sand and grav. deposits	3,000 c. y.	1.00	.40	.20
5. Tamped fills, corners of tun. invert	6,600 f.	.75	2.00	.50
6. Install perm. steel tun. supports	1,200,000 lb.	.03	.03	.035
7. Furn., erect perm. tunnel timbering	430 Mbm.	90.00	110.00	150.00
8. Install steel tunnel-liner plates	50,000 lb.	.03	.05	.03
9. Washed gravel or spalls outside tunnel-liner plates	100 c. y.	6.00	5.00	4.00
10. Remove perm. steel tunnel supports	10,000 lb.	.04	.05	.085
11. Remove perm. timbering in tunnel	3 Mbm.	50.00	100.00	100.00
12. Re-erect perm. timbering in tunnel	2 Mbm.	50.00	100.00	100.00
13. Install ventilating pipe	26,200 l. f.	1.25	.40	.60
14. Install drainage pipe	15,000 l. f.	.75	.50	.60
15. Gunite in gunite coating	100 c. y.	25.00	30.00	27.00
16. Constr. 6-in. tile drains under conc. invert.	4,600 l. f.	2.00	1.00	1.00
17. Inst. weep pipes from drainage sumps	350 lb.	.20	.20	.20
18. Drill feeler or pilot holes ahead of tunnel excav.	10,000 l. f.	.50	.50	.50
19. Drill grout holes, follow tun. excav.	3,000 l. f.	.50	.50	1.00
20. Place grout pipe and fittings	1,600 lb.	.25	.50	.20
21. Grouting ahead of tun. excav.	4,700 c. f.	1.50	2.00	2.00
22. Grouting following tun. excav.	1,600 c. f.	1.50	2.00	2.00
23. Grouting behind steel tun. liner plates	1,000 c. f.	1.50	1.50	2.00
24. Conc. in tunnel invert	6,380 c. y.	17.20	17.50	16.00
25. Constr. track on conc. invert	14,200 l. f.	2.00	1.40	1.60

BROOKLYN TUNNELS
BROOKLYN-BATTERY TUNNEL, N. Y.

OWNER: New York City Tunnel Authority, 200 Madison Ave., New York, N. Y.

PROJECT: Construction of two 31-ft. tunnels under Hamilton Ave., Brooklyn, and under Buttermilk Channel, New York, N. Y. (Contract 5). To be driven from shafts under construction in Brooklyn; to be generally excavated by use of shields under compressed air; and run from Brooklyn Shaft to Governors Island Shaft. Includes placing of heavy cast iron lining; placing of concrete lining inside cast iron lining under this contract, and inside light cast iron or structural steel tunnel lining in another part of tunnel immediately north of present work; completion of Brooklyn Construction Shaft, including permanent roofs and backfilling; removal of temporary blanket in Buttermilk Channel; maintenance of street and river traffic; temporary water pipe and electric cable lines; protection of buildings adjacent to work; removing existing sewers and constructing new ones; restoration of surface, subsurface and submarine facilities affected by work; placing of temporary and permanent street paving; and remove existing field office building from Long Island City and erect on new site near Brooklyn Construction Shafts.

CONDITIONS: Tunnel Authority to furnish heavy cast iron tunnel lining and ceiling tile. Contractor to furnish all other materials. In addition, contractor is required to furnish bolts, nuts and washers for Contract 6, Manhattan Tunnels. Rail, street and water transportation facilities available. Time for completion 40 calendar months. Wage rates specified in free air are: skilled labor, $1.25 to $2.25 per hr.; semi-skilled, 91⅞c. to $1.50; and common, 87½c. In compressed air up to 18-lb. pressure rates are from $10.00 to $12.50 per day. Divers' rate is $14.00 per day.

BIDS: Five bids were received May 27, 1941, ranging from the contract low of $13,888,851 to $18,318,121.

LIST OF BIDDERS:

1. George H. Flinn Corp., New York, N. Y. (contract) . $13,888,851
2. S. A. Healy Co., Inc., White Plains, N. Y. 14,399,891
3. Rosoff Tunnel Corp., New York, N. Y. 15,794,810
4. Mason & Hanger Co., Inc., New York, N. Y. 17,307,953
5. Associated Contractors, Inc., and Pleasantville Constructors, Inc., Long Island City, N. Y. 18,318,121

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Trench excav., earth, sewers, manholes, etc., incl. disposal	5,000 c. y.	$25.00	$11.50	$25.00
2. Tunnel excav., earth; east and west tunnels, incl. disposal (S. of Sta. 77+65 E. tun.; S. of Sta. 78+75 W. tun.)	138,600 c. y.	41.60	57.00	60.00
3. Tunnel excav., mixed face; as above	20,000 c. y.	76.40	73.00	80.00
4. Tunnel excavation, rock; as above	3,200 c. y.	44.40	53.00	60.00
5. Tunnel excav., rock; E. and W. tunnels, north of stations noted above	24,700 c. y.	22.25	15.50	12.00
6. Tunnel timbering	6 M bm.	100.00	100.00	100.00
7. Steel supports	15 ton	100.00	100.00	100.00
8. Furnish, install, maintain and remove temp. 10-in. c. i. water main	L.S.	180,000.00	54,000.00	50,000.00
9. As above, four-conductor cable	L.S.	120,000.00	37,000.00	30,000.00
10. Cement used in concrete	72,500 bbl.	2.00	2.45	3.00
11. Concrete, excl. cem., inside hvy. c. i. tunnel lining	32,500 c. y.	28.90	30.00	30.00
12. Conc., lt. c. i. or str. steel lining (and inside cross passage and trans'n. ring)	14,100 c. y.	28.90	30.00	30.00
13. Conc., in cradles for shields	300 c. y.	29.40	30.00	40.00
14. All other concrete	1,300 c. y.	21.40	30.00	25.00
15. Brick masonry, in place	10 c. y.	60.00	36.50	50.00
16. Hollow terra cotta tile masonry	5 c. y.	60.00	35.00	50.00
17. Neat portland cem. grout, ejected thru c. i. tun. lining or conn. rings; not in comp. air	10 bbl.	15.00	8.00	6.00
18. Neat port. cem., ejct. thru tun. lining, placed in comp. air	90 bbl.	17.00	10.00	10.00
19. For 1:1 neat port. cem. as in No. 17 above	1,500 bbl.	13.00	5.00	6.00
20. For 1:1 neat port. cem., as in No. 18 above	19,100 bbl.	17.00	6.00	7.00
21. Pea gravel eject. thru. tun. lining, not in compressed air	250 c. y.	12.00	18.00	8.00
22. Pea gravel, as above, in comp. air	6,150 c. y.	17.50	20.00	10.00
23. Str. steel, except elsewhere provided for	1,380 ton	140.00	100.00	120.00
24. Connecting rings betw. hvy. c. i. tunl. lining and Brklyn. const. shafts	20 ton	900.00	440.00	500.00
25. Miscellaneous galv. steel	800 lb.	.30	.22	.40
26. Misc. steel, not galv	44,000 lb.	.18	.19	.30
27. Misc. galvanized wrought iron	3,300 lb.	.21	.24	.50
28. Miscellaneous malleable iron	800 lb.	.30	.45	.70
29. Cast iron castings	10 ton	400.00	335.00	400.00
30. Cast steel castings	3 ton	500.00	400.00	600.00
31. Steel reinforcement bars	650 ton	150.00	110.00	120.00
32. Wire mesh for reinf. conc. (not in No. 33 and 34)	363,000 lb.	.14	.11	.10
33. Wire mesh for beam wrapper	400 lb.	.30	.14	.35
34. Wire mesh at flanges, and stiffeners of str. steel tun. lining	34,400 lb.	.22	.16	.20
35. Furn., set steel curbs, with anchorages	15,360 l. f.	5.00	3.30	3.50
36. 1¼-in. bolts, hvy. c. i. tunnel lining	304,400 ea.	1.50	1.50	1.25
37. Furn. and deliver 1¼-in. bolts	20,000 ea.	1.50	1.00	1.50
38. Permanent steel tie-rod units	365 ea.	200.00	150.00	130.00
39. Type A ceiling hanger unit, hvy. c. i. tun. lining	515 ea.	42.00	42.00	50.00
40. Types B or C ceil. hanger units, lt. c. i. lining or str. steel lining	215 ea.	44.00	44.00	55.00
41. Erect. heavy c. i. lining, str. and taper rings, excl. bolts, nuts and washers	2,100 ea.	600.00	410.00	727.00

PIONEER
Foto Facts
No. 15

To produce good gravel, E. P. Brady knew he would have to reject excess sand which cuts down the output of any plant. He also knew he needed big production for profitable operation.

QUANTITY PRODUCTION · QUALITY PRODUCTS

E. P. BRADY
825 DICKENSON STREET
FLINT, MICHIGAN

Pioneer Engineering Works,
Minneapolis, Minnesota.
Gentlemen;

It is now about three and one-half months since we received our new Pioneer 48-V Duplex crushing and screening plant, and we have operated it almost continuously through our Michigan winter. There have been a number of days when it has been considerably below zero, and we have produced gravel from wet pits as well as from dry ones.

Inasmuch as we have been making a very good grade of gravel most of the time, it has been necessary to reject sand. There have been times when we have had to take out almost as much sand on one side of the machine as we were getting gravel on the other side, and we were still able to produce gravel at the rate of 140 yards per hour, which we think is very good production!

I wish to take this opportunity to tell you that the performance of this plant is certainly all that could be desired of a portable plant.

We are also finding that the Caterpillar power unit is very economical to operate and our production costs are exceedingly low - - - even lower than our fondest hopes.

We find that this plant moves very easily considering the weight, and even though we have moved it over some very hilly country through our winter months, we have yet to experience any difficulty.

With kindest personal regards, and wishing you continued success, I am

Very truly yours,
E P Brady

E. P. Brady solved his problem with a Pioneer 48-V Crushing, Screening and Loading Plant . . . and read what he says about the results.

"—TAKE OUT ALMOST AS MUCH SAND ON ONE SIDE OF THE MACHINE AS WE ARE GETTING GRAVEL ON THE OTHER SIDE, AND WE WERE STILL ABLE TO PRODUCE GRAVEL AT THE RATE OF 140 YARDS PER HOUR, WHICH WE THINK IS VERY GOOD PRODUCTION."

The 48-V Plant is the largest of five sizes of Duplex Gravel Plants. They will all produce crushed gravel, reject sand and produce stone chips.

Send for your free copy of our handy reference — "FACTS AND FIGURES"

PIONEER ENGINEERING WORKS
1515 Central Ave., Minneapolis, Minnesota, U. S. A.

42. One-ply waterproofing	400 s. y.	.65	.40	.60
43. Waterproofing, brick in asph. mastic	30 c. y.	60.00	33.00	40.00
44. Inst. 4¼x4¼-in. ceramic ceiling tile (no gripper)	166,300 s. f.	.80	.42	.50
45. Inst. 6x6-in. glass ceil. tile with grippers	165,000 s. f.	.65	.27	.35
46. Glazed arhitect. terra cotta	43,400 s. f.	1.60	1.90	2.00
47. 6-in. cast iron bell and spigot cem. lined pipe	7,400 l. f.	3.50	1.72	2.00
48. 6-in. c. i. flanged cem. lined pipe	320 l. f.	6.50	2.83	4.50
49. 12-in. vitr. pipe sewer, incl. cradle	290 l. f.	6.50	5.40	8.00
50. 18-in. vitr. pipe sewer, incl. cradle	300 l. f.	10.00	3.15	10.00
51. 24-in. vitr. pipe sewer, incl. cradle	70 l. f.	16.00	4.50	15.00
52. Flat top rein. conc. sew, egg-shaped invert (5' 9" by 3' 10")	125 l. f.	50.00	24.00	30.00
53. As above, circular invert (6x6-ft.)	255 l. f.	55.00	30.00	40.00
54. As above, barge-shaped invert (6x7½-ft.)	400 l. f.	65.00	34.00	50.00
55. Vit. pipe spurs for vit. pipe sewers	35 ea.	5.00	4.50	5.00
56. Cast iron spurs for rein. conc. sewers	55 ea.	5.00	23.00	7.00
57. Vitr. brick manhole linings, vit. sewer	10 s. y.	7.00	3.35	10.00
58. Plastering in manholes, vit. pipe sew	80 s. y.	5.00	.60	3.00
59. House sewers, all sizes, incl. cradles, etc.	500 l. f.	5.00	15.50	15.00
60. Remove exist. sewer, Hamilton Ave.	L.S.	150,000.00	40,000.00	50,000.00
61. Part removal exist. Carroll St. sewer	L.S.	40,000.00	1,600.00	10,000.00
62. Inst. galv. c. i. boxes, types CQ, CR, CS, CU	17,000 lb.	.30	.50	.70
63. As above, types CT, CV, CW	35,000 lb.	.30	.58	.80
64. As above, types CL, CP	68,000 lb.	.30	.55	1.00
65. 1-in. silicon bronze tubing	1,600 l. f.	1.10	1.75	1.50
66. 1½-in. silicon bronze tubing	3,100 l. f.	1.50	2.00	2.50
67. 1¼-in. silicon bronze tubing	540 l. f.	2.50	2.25	3.00
68. 3-in. asbestos cem. conduit	13,700 l. f.	.50	.56	1.00
69. 2½-in. asbestos cem. conduit	7,600 l. f.	.65	.56	1.20
70. 3-in. asbestos cem. conduit	30,500 l. f.	.80	.56	1.30
71. 4½-in. asbestos cem. conduit	400 l. f.	1.00	1.00	2.00
72. 4½-in. galv. steel conduit	500 l. f.	2.20	3.50	3.00
73. 4½-in. single-way vitr. clay tunnel ducts	44,000 d. f.	.40	.37	.40
74. 3½-in. nine-way vitr. clay tunnel ducts	67,000 d. f.	.30	.56	.30
75. Restore sh. asph. pavmt. betw. curb lines	500 s. y.	3.00	4.00	5.00
76. Restore gran. block pavmt. betw. curb lines	400 s. y.	7.00	11.50	6.00
77. Restore gran. headers, incl. cradles	30 l. f.	1.50	2.00	5.00
78. Furn., lay, maintain temp. roadway pavement	1,000 s. y.	2.00	2.00	5.00
79. Furn., inst. timbers for supporting sewer, except piles	50 M bm.	125.00	100.00	100.00
80. Timber piles for supporting sewers	12,500 l. f.	1.50	.75	3.00
81. Miscellaneous copper	4,000 lb.	1.65	.60	.80
82. Miscellaneous brass	5,600 lb.	1.65	.60	1.00
83. Miscellaneous bronze	200 lb.	2.30	.60	1.00
84. Misc. silicon bronze stud bolts and nuts	50 lb.	2.30	1.00	1.20
85. Galv. c. i. boxes, air measur. apparatus	520 lb.	1.25	1.00	1.00
86. Fresh air flues, types SW and OSW	1,188 ea.	75.00	55.00	50.00
87. Exhaust air ports, types 6WA, 6WB, 6WC, for ceramic or glass tile	284 ea.	75.00	100.00	50.00
88. As above, types 6N (D & E) for ceramic tile and 6ND, E, F, & G for glass tile	448 ea.	75.00	90.00	50.00
89. As above, type 5NF ceramic, or type 5NH for glass	178 ea.	75.00	90.00	50.00
90. As above, type 4NG ceramic, 4NJ glass	120 ea.	75.00	70.00	50.00
91. As above, type 3NH ceramic, 3NK glass tile	168 ea.	75.00	60.00	50.00
92. Restore overhd. trolley railroad	1,000 l. f.	20.00	12.00	3.00
93. Maintain, protecting and underpinning, etc., various bldg., Hamilton Ave.	L.S.	174,000.00	26,000.00	90,015.00
94. Maintain, protect, etc., new bldg. on Summit St.	L.S.	20,000.00	5,000.00	20,000.00
95. Remove, re-erect exist. field office	L.S.	35,000.00	17,500.00	50,000.00
96. Ceil. hanger units, type D, Bklyn. Constr. Shaft	4 ea.	70.00	63.00	70.00

MANHATTAN TUNNELS
BROOKLYN-BATTERY TUNNEL

OWNER: New York City Tunnel Authority, New York, N. Y.; Alfred B. Jones, chairman; Ole Singstad, chief engr.

PROJECT: Construction of Manhattan Tunnels (Contract 6) of the Brooklyn-Battery Tunnel from the Manhattan construction shaft in Battery Park to points in East River northeast of Governor's Island. Approximate length 2,400 feet. Includes all tunnel excavation; furnishing and erecting light cast iron tunnel lining; erecting heavy cast iron lining furnished by the Authority; placing of concrete lining and interior construction inside metal tunnel lining; permanent roof and fill in Manhattan construction shaft; and removal of field office from present location and re-erecting in vicinity of shaft at Battery. It is necessary to protect, support and maintain all buildings, monuments, piers, wharves, bulkheads and other structures in vicinity during construction period.

CONDITIONS: Alternate methods of disposal of excavated material were permitted, Schedule A allowing disposal at place selected by contractor other than at Battery Park, and Schedule B allowing partial special disposal at the Park, and other disposition at place selected by contractor. Alternates were also allowed on tunnel lining, light cast iron (Schedule C), or structural steel (Schedule D). Award was made on basis of Schedules B and C, which are tabulated below. Other contracts may be started during the life of this one, and care must be taken by contractor not to interfere with them. Time for completion 37 calendar months. Wage rates in compressed air (18 lb. per sq.in.) range from $11.00 to $12.50 per six-hour day. Higher pressures increase base rate 50c. per day when pressure exceeds 18 lb. and may reach an additional $3.00 per day if pressure tops 48 lb. In free air minimum wage rates are: skilled labor, $1.40 to $2.25 per hr.; semi-skilled, 90c. to $1.60; and common, 87½c.

BIDS: Four bids were received September 16, 1941, ranging from the contract low of $13,948,619 to $15,890,741. (On basis of Schedules B, C and E).

LIST OF BIDDERS:

1. Mason & Hanger Co., Inc., New York, N. Y. $13,948,619
2. Seaboard Constr. Corp., Mt. Kisco, N. Y. 14,300,676
3. S. A. Healy Co., Inc., White Plains, N. Y. 15,604,110
4. Rosoff Tunnel Corp., New York, N. Y. 15,890,741

Schedule B—Tunnel Excavation, Including Special Disposal of it at Battery Park

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Tun. excav. bet. Sta. 32+20 and 34+20 E. tunnel and Sta. 32+90 and 34+60 W. tunnel, incl. disp. select. by contr.	11,400 c. yd.	$82.00	$136.56	$88.00
2. Tun. excav. north of Sta. 53+15 E. tunnel and 53+35 W. tunnel, incl. disp. at Battery Park, except as under Item 1	75,200 c. y.	33.50	27.95	42.25
3. Tun. excav., as above, at site selected by contractor, except as in Item 1	61,200 c. y.	34.50	29.20	43.00
4. Tun. excav., as above, except South of stations noted, incl. disp. at Park	12,300 c. y.	14.00	17.00	12.25
5. Tun. excav., as above, incl. disp. at place selected by contractor	12,300 c. y.	15.00	18.00	13.00

Schedule C—Light cast-iron tunnel lining

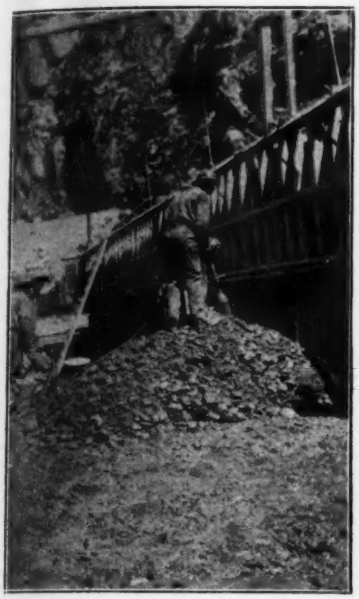
Item	Quan.	Unit Prices (1)	(2)	(3)
1. Cement used in concrete	72,700 bbl.	$3.00	$2.50	$2.80
2. Concrete, exc. cement, inside lt. and hvy. c. i. tun. lining, incl. inside cross-passage	47,200 c. y.	30.00	30.00	37.00
3. All other concrete, excl. cement	1,250 c. y.	30.00	30.00	33.75
4. Fill voids outside lt. c. i. tun. lining, north or stations noted	4,450 l. f.	125.00	143.00	79.00
5. As above, south of stations noted	850 l. f.	125.00	130.00	79.00
6. Str. steel conn. rings betwn. c. i. tun. lining and Manhattan constr. shaft	25 ton	700.00	500.00	440.00
7. Frames conn. lt. c. i. tun. lining to c. i. lining of cross-passage	20 ton	700.00	700.00	575.00
8. 1⅜-in. h. t. steel bolts for lt. c. i. tun. lining, north of stations noted	267,700 ea.	1.00	.80	.75
9. As above, south of stations noted	51,000 ea.	1.00	.75	.75
10. 1-in. h. t. steel bolts for 9-ft. c. i. tun. lining	650 ea.	.50	.50	.45
11. Furn. and del. 1⅜-in. h. t. steel bolts for lt. c. i. tunnel lining	249,000 ea.	.60	.50	.50
12. Furn. and del. 1-in. h. t. st. bolts for 9-ft. c. i. tun. lining	500 ea.	.30	.25	.25
13. Type B ceiling hanger units for lt. c. i. tun. lining	690 ea.	50.00	40.00	50.00
14. 31-ft. lt. c. i. straight rings, incl. 4 half "A" segments, north of sta. noted	19,000 ton	99.00	109.70	112.00
15. As above, taper rings, n. of sta. noted	1,820 ton	114.00	124.20	124.00
16. As above, c. i. transition rings	55 ton	154.00	164.60	165.00
17. 9-ft. c. i. stright rings, n. of sta. noted	15 ton	234.00	237.40	230.00
18. 31-ft. lt. c. i. straight rings, south of sta. noted	3,760 ton	99.00	105.00	112.00
19. As above, taper rings	200 ton	114.00	120.00	124.00
20. Special lt. cast iron closure rings	25 ton	334.00	300.00	285.00
21. Furn. and del. 31-ft. lt. c. i. straight rings, inc. 4 half "A" segements	17,250 ton	72.00	69.70	82.00
22. Furn. and del. 31-ft. lt. c. i. taper rings	2,120 ton	84.00	82.20	94.00
23. Furn. and del. 31-ft. c. i. transition rings	30 ton	120.00	119.60	130.00
24. Furn. and del. 9-ft. c. i. straight rings	12 ton	190.00	192.40	200.00
25. Special light c. i. closure rings	50 ton	250.00	254.80	253.00

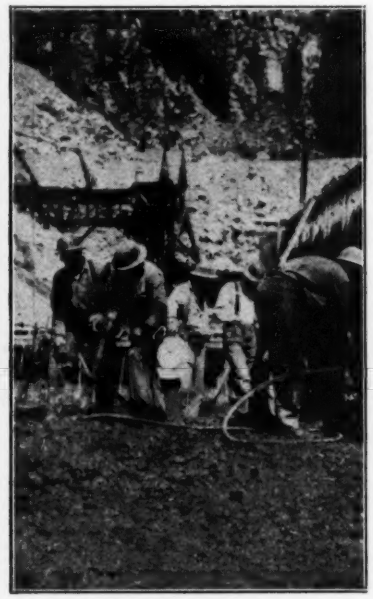
Schedule E

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Tunnel timbering, exc. betw. sta. noted.	80 M bm.	$100.00	$100.00	$100.00
2. Steel supports, except betw. stations noted	200 ton	110.00	110.00	110.00
3. Filling voids outside hvy. c. i. tun. lining	310 l. f.	125.00	205.00	79.00
4. Hollow terra cotta tile masonry	5 c. y.	70.00	100.00	45.00
5. Str. steel not otherwise provided for	1,380 ton	150.00	120.00	125.00
6. Misc. galvanized steel	300 lb.	.30	1.50	.36
7. Misc. steel, not incl. in Item 6	52,550 lb.	.25	.30	.26
8. Misc. malleable iron	720 lb.	.40	1.00	.65
9. Cast-iron castings	9 ton	400.00	500.00	400.00
10. Cast-steel castings	4 ton	500.00	600.00	500.00
11. Steel reinf. bars built in conc.	590 ton	150.00	175.00	120.00
12. Wire mesh used in rein. conc. except as under Item 13	364,700 lb.	.12	.20	.13
13. Wire mesh for beam and column wrap	800 lb.	.50	.20	.19
14. Furn. and set steel curb with anchorages	15,350 l. f.	4.00	4.00	4.25
15. Permanent tie-rod units	90 ea.	150.00	200.00	190.00
16. Type A ceiling hanger units for hvy. cast iron tun. lining	30 ea.	40.00	50.00	48.00
17. Type D ceiling hanger units for Manh. constr. shaft	8 ea.	75.00	75.00	70.00
18. Erect hvy. c. i. tunnel lining (Auth.)	116 ring	600.00	600.00	550.00

★ ★ ★ ★ CHICAGO PNEUMATIC NEWS ★ ★ ★ ★

LOW MAINTENANCE COST FEATURE OF CP VIBRATORS





↑ TOPPING TIME: 2 MINUTES! Here are eight yards of concrete and four men with two CP-518 Vibrators. The second picture was taken two minutes later. Note the concrete is topped off — a typical performance with the CP-518, a two-man vibrator for concrete batches of 2 cubic yards or more; ideal for knocking down and compacting heavy, harshest concrete in open forms — gravity dams, large bridge piers, mats, etc.

1.7 MILLS PER CUBIC YARD TYPICAL REPAIR PARTS COST

Used on Many Large Dam Jobs

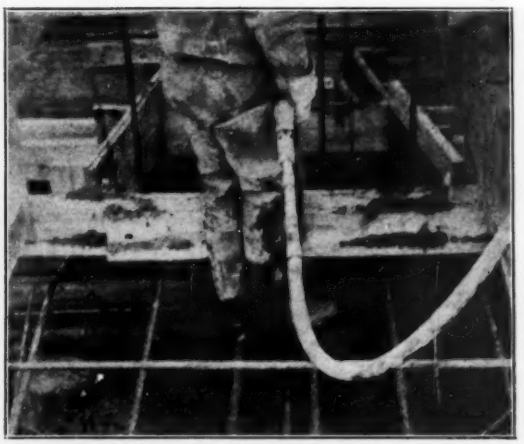
NEW YORK — On practically every outstanding construction project—Grand Coulee, Marshall Ford, Ruby, Friant, Shasta and Hansen Dams, Baton Rouge Bridge, Delaware River Aqueduct — Chicago Pneumatic Concrete Vibrators have shown remarkably low maintenance costs. A typical record is that made on one large dam job: four CP-518 Vibrators placed a total of 312,000 cubic yards of concrete—approximately 75,000 cubic yards per vibrator — at a cost for repair parts of 1.7 mills per cubic yard. Complete data on the seven models of CP Concrete Vibrators, Pneumatic and Electric, will be forwarded upon request.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 E. 44th St., New York, N. Y.

↑ FOR LIGHT REINFORCED CONCRETE SECTIONS, 3" slump and over, there is no vibrator faster or cheaper to operate than the CP-219. For walls and columns under 15" thick, light floor and roof slabs.

← FLUSHING MORTAR to the face of vertical key is an easy, speedy job with CP-419 Hicycle Electric Vibrator. For batches of mass concrete up to two cubic yards; medium bridge piers, mats, etc.



↑ PLACING CONCRETE IN LOCK FOUNDATION, CP-325 Concrete Vibrator. For concretes under 3" slump; walls and columns over 15" thick; heavy floor and roof slabs; appurtenances on heavy construction jobs. Especially designed for hard service.

CHICAGO PNEUMATIC

PNEUMATIC TOOLS

ALSO: Air Compressors, Electric Tools, Rock Drills, Hydraulic Aviation Accessories, Diesel Engines

WRENCHES
DRILLS
REAMERS
RIVETERS
CHIPPERS
GRINDERS

19. 1-ply waterproofing, tr. woven fabric, laid in coal tar pitch or asph.	320 s. y.	1.00	1.00	.60
20. Waterproofing, brick laid in asph. mastic	35 c. y.	60.00	60.00	45.00
21. 4¼x4¼-in. ceramic tile, no grippers (Auth.)	164,800 s. f.	.50	.80	.48
22. 6x6-in. glass ceil. tile, with grippers (Auth.)	164,000 s. f.	.35	.70	.33
23. Glazed architect. terra cotta	43,800 s. f.	2.00	1.80	2.25
24. 6-in. e.i. h. and s. cem. lined pipe, fittings	7,340 l. f.	3.00	2.50	2.10
25. 6-in. e. i. flanged cem. lined pipe, fittings, valves and specials	350 l. f.	6.00	4.50	3.20
26. 1¼-in. wr. iron pipe ferrules	170 l. f.	3.00	1.00	.75
27. Galv. c. i. boxes, types CQ, CR, CS and CU, without covers; electr. install.	17,900 lb.	.50	1.00	.40
28. As above, types CT, CV and CW	35,500 lb.	.50	1.15	.40
29. As above, types CL and CP	68,000 lb.	.50	1.30	.40
30. 1-in. silicon bronze elec. tubing, incl. br. boxes and fittings	1,500 l. f.	1.00	.50	1.50
31. 1¼-in., as above	3,600 l. f.	1.50	.80	1.75
32. 1½-in., as above	900 l. f.	2.00	1.00	2.00
33. 2-in. asbestos cement conduit	14,000 l. f.	.50	.80	.60
34. 2½-in. asbestos cement conduit	7,800 l. f.	.60	.80	.65
35. 3-in. asbestos cement conduit	31,000 l. f.	.70	.80	.70
36. 3½-in. galv. steel conduit, incl. fit	60 l. f.	3.00	2.00	2.00
37. 4½-in. galv. steel conduit, incl. fit	60 l. f.	3.00	2.50	2.50
38. 4¼-in. single-way vit. clay tun. ducts	37,440 duct. f.	.40	.40	.50
39. 3½-in. nine-way vit. clay tun. ducts	66,710 duct. f.	.35	.25	.30
40. 3¼-in. two-way vit. clay tun. ducts	7,500 duct. f.	.30	.30	.50
41. Reconstr. exist. bd. fence, Battery Pk.	L. S.	10,000.00	7,000.00	7,500.00
42. Miscellaneous copper, in place	3,550 lb.	1.50	2.00	.75
43. Miscellaneous brass, in place	6,030 lb.	1.50	2.00	.75
44. Misc. bronze (exc. silicon br.)	120 lb.	1.50	3.00	.75
45. Silicon bronze bolts and nuts	60 lb.	1.50	3.00	1.50
46. Galv. c. i. boxes for air-meas. apparatus	520 lb.	1.50	2.00	1.00
47. Fresh air flues, types S, SW and OSW	1,384 ea.	60.00	70.00	60.00
48. Exhaust air ports for ceramic ceiling or same types for glass ceiling tile, types 6WA, 6WB and 6WC	308 ea.	75.00	75.00	100.00
49. As above for ceramic ceiling, types 6ND and 6NE, or for glass ceiling tile, 6ND, 6NE, 6NF and 6NG	494 ea.	75.00	75.00	95.00
50. As above for ceramic ceil., type 5NF, for glass ceil. tile, type 5NH	168 ea.	75.00	75.00	95.00
51. As above, for ceramic, type 4NG, for glass, type 4NJ	172 ea.	75.00	75.00	75.00
52. As above, for ceramic, 3NH; for glass type 3NK	228 ea.	75.00	75.00	65.00
53. Remove conc. and steel placed by others in Manh. constr. shaft and furn. and place fill	L. S.	5,000.00	10,000.00	25,000.00
54. Remove, relocate exist. field office bldg.	L. S.	25,000.00	40,000.00	50,000.00

PEDESTRIAN TUNNEL CLEVELAND, OHIO

OWNER: City of Cleveland, Department of Public Service, John M. Wenrick, commissioner of engineering.

PROJECT: Construction of a pedestrian tunnel under the right-of-way and tracks of the Pennsylvania Railroad, south of and adjacent to Seager Avenue Underpass. Approximate length 120 ft. Involves all necessary excavation, concreting, liner plates, brick lining, trestle for switch track, waterproofing, painting and other miscellaneous work including drainage facilities.

CONDITIONS: Contractor to furnish all materials and complete work in 90 days. Rail, highway and water transportation facilities available. Wage rates specified are: bricklayers, $1.75 per hr.; semi-skilled, $1.10; and common, 90c.

BIDS: Five bids were opened September 11, 1941, ranging from the contract low of $28,993 to $42,693. Engineer's estimate, $31,446.

LIST OF BIDDERS:

1. Donnelly & Gallagher, Cleveland, Ohio (contract) $28,993
2. Harvey & Courey Constr. Co., Cleveland, Ohio 34,793
3. National Engineering and Contracting Co., Cleveland, Ohio 35,859
4. The Kalill Co., Cleveland, Ohio 38,103
5. The National Construction Co., Cleveland, Ohio 42,693

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation in open cut	2,000 c.y.	$2.75	$3.95	$1.00
2. Removing old concrete	130 c.y.	5.00	16.00	9.00
3. Excavation in tunnel section	380 c.y.	10.00	12.63	20.00
4. Structural concrete	340 c.y.	20.00	15.00	14.00
5. Sidewalks and special structures	15 c.y.	15.00	12.00	25.00
6. Grout	6 c.y.	20.00	35.00	12.00
7. Cement	570 bbl.	2.30	2.50	2.50
8. Grout machine	L. S.	500.00	300.00	850.00
9. Liner plates	3,420 s.f.	1.00	.70	2.00
10. Brick lining	2,710 s.f.	1.20	1.22	2.50
11. Trestle for switch track	L. S.	500.00	1,300.00	545.00
12. Steel reinforcing	40,000 lb.	.05	.08	.05
13. Waterproofing	380 s.y.	1.00	.60	.90
14. Electrical work	L. S.	150.00	500.00	450.00
15. Western Union manhole	L. S.	100.00	300.00	420.00
16. Painting walls of tunnel	35 s. y.	1.00	2.00	1.00
17. Drainage	L. S.	250.00	1,500.00	200.00

RIVER IMPROVEMENT LOS ANGELES, CALIF.

OWNER: U. S. Engineer Office, Los Angeles, Calif.: Lt. Col. E. C. Kelton, district engineer.

PROJECT: Constructing approximately 7,087 linear feet of improved river channel from River Mile 15.3 to 16.6 along Los Angeles River east of Maywood in adjacent unincorporated area of Los Angeles County. Work involves care of water and drainage during construction; clearing site and removal of existing obstructions; excavation and backfill for channel and structures; placing subgrade for railroad; raising railroad track; furnishing and driving steel sheet piles, test piles, and treated timber piles; bridge sub- and superstructures; rock fill and paving; plant-mixed surfacing; concrete for channel and structures; and side drainage structures. Channel, in general, will be of trapezoidal section with grouted rock paved slopes.

CONDITIONS: All work, except berm paving, channel fencing, Riverside Dr. paving and other work outside river channel, to be completed in 210 calendar days; entire project to be finished in 270 days. Owner will furnish all cement, and also all ballast and replacements for damaged ties and spikes required for raising railroad tracks. Railroad and highway transportation facilities available. Wage rates specified are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 62½c. to $1.00; common, 62½ to 75c.

BIDS: Six bids were opened April 2, 1941, ranging from the contract low of $1,150,436 to $1,497,560. Engineer's estimate, $1,296,508.

LIST OF BIDDERS:

1. United Concrete Pipe Corp., Los Angeles, Calif. (contract) $1,150,436
2. Winston Bros. Co., Los Angeles, Calif. 1,295,091
3. V. Bressi, Constructor, Los Angeles, Calif. 1,328,796
4. Floyd Shofner, Los Angeles, Calif. 1,348,131
5. Clyde W. Wood, Los Angeles, Calif. 1,394,939
6. Mittry Bros. Constr. Co., Los Angeles, Calif. 1,497,560

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove exist. round wood piles	850 ea.	$2.00	$3.85	$2.00
2. Remove exist. pavement	16,800 s. y.	.60	.08	.12
3. Remove exist. structures	L. S.	10,000.00	7,750.00	5,100.00
4. Remove L. A. Jct. R. R. bridge	L. S.	5,000.00	5,375.00	1,000.00
5. Remove Slauson Ave. Hwy. bridge	L. S.	10,000.00	12,000.00	4,000.00
6. Remove Pac. Elec. Ry. bridge	L. S.	5,000.00	4,500.00	2,000.00
7. Channel excavation	203,500 c. y.	.25	.40	.30
8. Toe excavation	84,000 c. y.	.25	.40	.30
9. Structure excavation	11,500 c. y.	1.30	1.35	3.00
10. Backfill and fill, uncompacted	35,000 c. y.	.10	.12	.15
11. Backfill and fill, compacted	214,000 c. y.	.12	.24	.18
12. Sheet steel piling	47,600 s. f.	1.10	1.05	1.25
13. Test piles	11 ea.	100.00	200.00	130.00
14. Treated timber piling	22,000 l. f.	1.00	1.55	1.40
15. Concrete; 8-in. pavement	6,100 s. y.	1.20	3.00	1.20
16. Conc.; invert slab, parapet walls, and footings for walls, piers, abutments	5,970 c. y.	5.16	6.50	6.65
17. Concrete; bridge superstruct	865 c. y.	16.00	27.00	32.00
18. Conc.; br. piers and abutments	1,510 c. y.	12.00	14.25	18.50
19. Concrete; retain. walls and curbs	2,120 c. y.	14.00	16.20	19.50
20. Conc.; for grouting derrick stone	12,200 c. y.	3.60	4.10	4.90
21. Concrete; slope paving toe	2,700 c. y.	4.00	5.65	7.15
22. Conc.; side drainage and misc. struct.	510 c. y.	15.00	18.50	30.00
23. Steel reinforcement	1,440,000 lb.	.038	.041	.045
24. 12-in. grouted rock paving	8,150 sq.	25.00	30.00	26.50
25. Cr. gravel or cr. rock backing	22,800 c. y.	1.60	1.50	1.80
26. Derrick stone, 1 — 3-ton class, toe protection	55,800 c. y.	3.60	3.25	4.00
27. Derrick stone, 1 — 7-ton class, rock apron	2,300 c. y.	3.50	3.70	4.00
28. Quarry run rock; toe protection	3,200 c. y.	2.50	1.40	4.00
29. Plant-mixed surfacing	23,400 s. y.	.50	.70	.70
30. 6-in. decomposed granite base	1,350 c. y.	1.50	3.00	1.60
31. 4-in. asphaltic conc. paving	1,900 s. y.	.60	.60	1.00
32. 6-in. asphaltic conc. paving	5,700 s. y.	.80	.80	1.20
33. Expansion joint sleeves	2,930 ea.	.40	.45	.30
34. 6-in. vitr. clay sewer pipe	350 l. f.	.40	1.50	2.00
35. 8-in. vitr. clay sewer pipe	550 l. f.	.50	2.00	2.00
36. 8 x 6-in. vitr. clay sewer pipe wyes	19 ea.	2.00	2.00	10.00
37. Manhole constr. and reconstr	L. S.	500.00	600.00	750.00
38. 18-in. corr. metal pipe	67 l. f.	3.00	3.50	3.00
39. 24-in. corr. metal pipe	54 l. f.	4.00	6.00	4.00
40. 30-in. corr. metal pipe	352 l. f.	5.50	7.00	7.00
41. 48-in. corr. metal pipe	57 l. f.	12.00	16.00	15.00
42. 18-in. automatic drainage gate	1 ea.	60.00	60.00	50.00
43. 24-in. automatic drainage gate	1 ea.	80.00	85.00	100.00
44. 30-in. automatic drainage gate	6 ea.	120.00	130.00	120.00

High Speed TRAIL-DUMP HAULING OVER ROUGH GRADE Saves Time

OSCILLATING FRONT AXLE ..UNIVERSAL ACTION HITCH

— on Koehring Trail-Dump absorbs road shocks, allows free movement of body for high speed travel over rough haul roads. Trail-Dump can climb 21" furrows without frame distortion. Free, universal action at upper end of hitch yoke allows wagon and tongue to move in any direction without body twisting strains. These important advantages permit high speed travel without penalty of twisting strains, excessive repair costs. High speed travel increases loads per hour, yardage per hour.

KOEHRING COMPANY
MILWAUKEE • WISCONSIN

Koehring Trail-Dump has oscillating steering axle, free universal action at top of hitch yoke . . . for high speed travel over rough haul roads.

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

45. 48-in automatic drainage gate	1 ea.	300.00	340.00	200.00
46. Channel fencing	6,285 l. f.	.40	.40	.40
47. Miscellaneous metals	4,500 lb.	.20	.20	.20
48. Bridge steel; Slauson Ave. Br	1,115,000 lb.	.10	.106	.10
49. Bridge steel; Pac. Elec. Ry. Br	925,000 lb.	.085	.0875	.085
50. Steel bridge railing	1,015 l. f.	6.00	6.40	6.00
51. Track raising	3,560 l. f.	5.00	.40	4.50

FLOOD PROTECTION
PADUCAH, KY.

OWNER: U. S. Engineer Office, Louisville, Ky.

PROJECT: Work to be done consists of construction of earth levees, steel sheet piling and concrete walls, drainage and movable closure structures, toe drains, sewers, concrete gutters, manholes, catch basins, and appurtenant works in northeastern part of city of Paducah, Ky. (Section B, Unit 1). Protection works begin at end of existing levee, near Mill and Meyers Streets, and extend downstream along bank of Ohio River to Tennessee Street. Sloughs, old pits, ditches or depressions between right-of-way limits and base of embankment, both land and riverside, to be filled to natural ground line.

CONDITIONS: Rights-of-way and borrow area for constructing embankment walls, etc., to be furnished without cost to contractor. Contractor to furnish all other material. Work to be completed within one year, and without interference to other contractors. Rail, highway and water transportation facilities available. Contractor to maintain traffic, or provide detours for highways; maintain utility services; and to interfere with railroad traffic and manufacturing operations in vicinity as little as possible. Wage rates are: skilled labor, $1.00 to $1.50; semi-skilled, 50 to 75c.; and common labor, 50c. per hr.

BIDS: Thirteen bids were opened February 11, 1941, ranging from the contract low of $346,284 to $549,391. Engineer's estimate $429,461.

LIST OF BIDDERS:

1. C. E. Carson Co., Chicago, Ill. (contract) $346,284
2. A. G. Ryan & Sons, Evansville, Ind. 385,458
3. Foster & Creighton Co., Nashville, Tenn. 403,274
4. Drainage Contractors, Inc., Detroit, Mich 406,038
5. Hoeffken Bros. Supply & Constr. Co., and G. E. Tillman, Centralia, Ill. 418,822
6. R. B. Potashnick, Cape Girardeau, Mo 419,683
7. The Kramp Constr. Co., Inc., Milwaukee, Wis. 444,236
8. Regenhardt Constr. Co., Cape Girardeau, Mo. 445,809
9. Midland Constructors, Inc., Chicago, Ill 472,929
10. Fitz Simons & Connell Dredge & Dock Co., Chicago, Ill. 475,299
11. L. B. Strandberg & Son, Chicago, Ill. 492,180
12. Stiers Bros. Constr. Co., St. Louis, Mo. 499,929
13. J. B. Michael & Co., Memphis, Tenn. 549,391

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Levee embankment	54,000 c. y.	$0.60	$0.45	$0.35
2. Rolling, for each 3 add'l. passes	3,000 sq.	.02	.02	.14
3. Stripping	5,400 c. y.	.50	.30	.20
4. Common excavation	19,000 c. y.	.40	.75	.71
5. Backfill, compacted	10,600 c. y.	.50	1.00	.50
6. Concrete	13,880 c. y.	12.90	15.00	16.80
7. Reinforcing steel	840,000 lb.	.04	.044	.045
8. Steel sheet piling	790,000 lb.	.04	.045	.0475
9. Structural steel	7,300 lb.	.175	.25	.15
10. Miscellaneous metals	14,100 lb.	.30	.30	.42
11. Copper	17,200 lb.	.50	.35	.35
12. Vault door and frame	14 ea.	105.00	100.00	230.00
13. Seal trench filler	325 s. f.	.50	1.00	1.00
14. Hand placed riprap	1,025 c. y.	6.00	4.00	5.00
15. Gravel blanket	760 c. y.	1.50	2.00	2.00
16. Raise, relocate, replace railroad tracks	L. S.	500.00	2,900.00	5,550.00
17. 8-in. corrugated iron pipe	45 l. f.	2.00	3.80	2.00
18. 18-in. corrugated iron pipe	45 l. f.	4.00	3.50	3.75
19. 66-in. corrugated iron pipe	157 l. f.	17.50	17.00	20.00
20. Galv. iron seep ring	520 s. f.	1.50	1.25	1.60
21. 6-in. wrought iron pipe	24 l. f.	3.50	4.00	4.00
22. 8-in. wrought iron pipe	125 l. f.	4.50	5.00	4.60
23. 12-in. wrought iron pipe	58 l. f.	9.00	12.00	6.50
24. 18-in. wrought iron pipe	122 l. f.	15.00	15.00	10.00
25. 30-in. wrought iron pipe	26 l. f.	95.00	40.00	25.00
26. 6-in. cast iron pipe	100 l. f.	3.60	3.00	2.00
27. 8-in. cast iron pipe	52 l. f.	4.00	5.00	3.50
28. 24-in. cast iron pipe	20 l. f.	100.00	20.00	25.00
29. 8-in. automatic drainage gate	1 ea.	20.00	20.00	21.00
30. 18-in. automatic drainage gate	2 ea.	40.00	40.00	60.00
31. 66-in. automatic drainage gate	1 ea.	450.00	550.00	550.00
32. 6-in. sluice gate	1 ea.	140.00	200.00	100.00
33. 8-in. sluice gate	1 ea.	175.00	225.00	125.00
34. 12-in. sluice gate	1 ea.	250.00	275.00	180.00
35. 24-in. sluice gate	1 ea.	600.00	575.00	500.00
36. 30-in. sluice gate	1 ea.	700.00	650.00	600.00
37. 8-in. toe drain	4,560 l. f.	1.50	1.75	2.00
38. 12-in. toe drain	820 l. f.	2.00	2.50	2.75
39. 6-in. vitr. sewer pipe	26 l. f.	.50	1.25	.75
40. 8-in. corr. iron pipe sewer	930 l. f.	2.00	2.50	1.40
41. 12-in. corr. iron pipe sewer	55 l. f.	2.50	3.75	3.00
42. 18-in. corr. iron pipe sewer	33 l. f.	4.00	5.00	4.00
43. Concrete gutter	360 l. f.	1.00	1.25	1.00
44. Pipe conn. and valve sta. 52+30	L. S.	60.00	270.00	140.00
45. Pipe conn. and valve sta. 81+37.8	L. S.	75.00	270.00	110.00
46. Relocate 6-in. vitr. pipe	L. S.	50.00	150.00	55.00
47. Pipe conn. through wall	L. S.	150.00	650.00	600.00
48. Pipe conn. through wall	L. S.	100.00	750.00	700.00
49. Misc. pipe conn. through wall	L. S.	400.00	1,575.00	325.00
50. Remove exist. conc. structures	350 c. y.	7.50	3.00	2.00
51. Remove exist. pipes	950 l. f.	1.00	1.50	.25
52. Connections to exist. drains	15 ea.	50.00	50.00	20.00
53. Shoring left in place	1 Mbm.	50.00	50.00	50.00

LANDWARD LOCK MASONRY
MISSISSIPPI RIVER LOCK AND DAM

OWNER: U. S. Engineer Office, St. Paul, Minn.

PROJECT: Construction of masonry work for new lock at Lock and Dam No. 2, Mississippi River, landward of existing lock located on right bank of river about 1.4 miles upstream from Hastings, Minn. This contract includes coffer-dam, piling, concrete and other appurtenant work. The lock will be standard size Mississippi River lock, of chamber size 110-ft. by 600-ft., and will be founded on piling.

CONDITIONS: Contractor is required to furnish all material, plant and labor, and complete work in 480 days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 50 to 85c.; and common, 50c.

BIDS: Six bids were opened May 13, 1941, ranging from the contract low of $1,532,878 to $1,772,707.

LIST OF BIDDERS:

1. Winston Bros. Co., Minneapolis, Minn. (contract) $1,532,878
2. United Construction Co., Winona, Minn. 1,536,168
3. Fegles Constr. Co., Ltd., Minneapolis, Minn. 1,553,150
4. Michael Pontarelli & Sons, Chicago, Ill. 1,638,896
5. A. Guthrie & Co., Inc., St. Paul, Minn. 1,668,311
6. Spencer, White & Prentis, Inc., New York, N. Y. 1,772,707

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Cofferdam protection	L. S.	$200,000.00	$46,906.39	$353,144.00
2. Excavation, common	253,000 c. y.	.40	.56	.74
3. Excavation, foundation	15,000 c. y.	1.00	.56	.83
4. Backfill	52,000 c. y.	.40	.22	.25
5. Grouting, cut-off wall	263 c. y.	50.00	27.00	40.00
6. Piling, round timber	144,175 l. f.	.60	.69	.60
7. Piling, steel bearing	39,340 l. f.	2.50	3.02	2.20
8. Piling, steel sheet	117,230 s. f.	1.50	1.55	1.42
9. Piling, flexible joint	6 ea.	900.00	450.00	452.00
10. Remove exist. steel sheet piling	8,730 s. f.	1.00	.27	.11
11. Install water supply pump	L. S.	830.00	178.00	490.00
12. Protection stone	195 c. y.	7.00	6.46	5.00
13. Class A concrete	1,285 c. y.	22.00	28.04	16.95
14. Class B concrete	49,520 c. y.	13.00	14.82	9.72
15. Steel, wall-armor	185,550 lb.	.098	.11	.09
16. Structural steel	103,920 lb.	.12	.13	.13
17. Steel, miscellaneous	73,575 lb.	.18	.18	.17
18. Concrete reinforcing steel	972,540 lb.	.05	.06	.056
19. Steel castings, class 1 and 2	17,350 lb.	.28	.35	.32
20. Steel castings, class 0	9,045 lb.	.24	.26	.24
21. Iron castings	10,170 lb.	.23	.20	.19
22. Copper — silicon — alloy	170 lb.	3.00	2.50	2.58
23. Copper water seal	4,550 lb.	1.09	.70	.68
24. Conduit, rigid metal, 1½ and 2-in.	360 l. f.	1.10	1.64	1.64
25. Conduit, rigid metal, 2½ and 3-in.	375 l. f.	2.51	3.61	3.60
26. Conduit, fibre, 3-in	5,220 l. f.	.50	.28	.27
27. Uplift pressure pipes (complete)	520 l. f.	1.40	.90	.45
28. Embedded water pipes (complete)	L. S.	300.00	239.00	152.00
29. Special water seal	6 ea.	140.00	419.00	237.00
30. Expansion joint filler	L. S.	12,000.00	8,000.00	7,900.00
31. Backwater trap and drain (complete)	4 ea.	70.00	59.37	40.00
32. Tile gage	77 l. f.	8.00	12.00	5.00
33. Electrical grounding system	L. S.	400.00	396.00	257.00
34. Moving buildings and misc. salvage work	L. S.	1,400.00	5,400.00	1,988.00
35. Temporary driveway	L. S.	5,000.00	2,000.00	2,570.00
36. Relocation of fences	L. S.	700.00	950.00	210.00
37. Control station drains (complete)	L. S.	100.00	116.00	49.00

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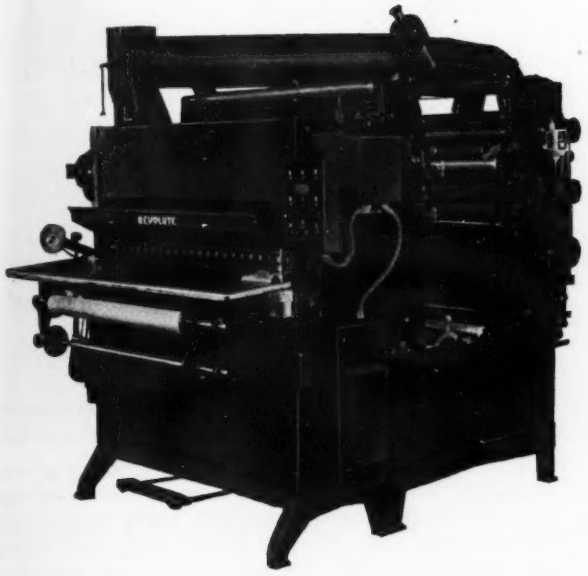

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ROCHESTER, NEW YORK

CHARENTON FLOODGATE
LOUISIANA

OWNER: U. S. Engineer Office, New Orleans, La.; Lt. Col. C. Kittrell, district engineer.

PROJECT: Construction of reinforced concrete floodgate structure equipped with manually-operated steel sector gates, including the steel sheet piling cutoff and retaining walls with their anchorages, timber foundation piling, earth excavation and fill, riprap, dolphins and all other appurtenant work. Structure located in the Charenton Intracoastal Canal Levee, approximately one mile north of Charenton, La.

CONDITIONS: Contractor to furnish all materials and complete work in 300 days. Transportation facilities to the vicinity of work are afforded by the Texas & New Orleans RR., and Louisiana State Highway 129. Floating plant may reach the site of the work, by three routes. Minimum wage rates specified are: skilled labor, 75 to 90c.; semi-skilled, 40 to 65c.; and common labor, 30c. per hr.

BIDS: Eight bids were received April 7, 1941, ranging from the contract low of $219,218 to $360,182. Engineer's estimate, $278,104.

LIST OF BIDDERS:

1. Pittman Bros. Constr. Co., New Orleans, La. $219,218
2. R. P. Farnsworth & Co., Inc., New Orleans, La. 224,684
3. Norman Constr. Co., Lake Charles, La. 230,274
4. Pittsburgh-Des Moines Steel Co., Des Moines, Iowa 231,497
5. Austin Bridge Co., Austin, Tex. 254,261
6. Newsom Bros. & J. W. Snowden, Columbia, Miss. 296,449
7. John Riess, New Orleans, La. 299,245
8. McWilliams Dredging Co., Chicago, Ill. 360,182

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Structure excavation	31,300 c. y.	$0.43	$0.31	$0.2875
2. Channel excavation	52,300 c. y.	.3225	.28	.111
3. Backfill	22,150 c. y.	.375	.34	.44
4. Untr. timber piles (under struct.)	31,760 l. f.	.365	.41	.86
5. Steel sheet piling	9,880 s. f.	1.05	1.08	1.33
6. Headwall anchors	4 ea.	250.00	468.00	941.00
7. Treated timber pile dolphins	4 ea.	300.00	438.00	630.00
8. Concrete, Class B	4,540 c. y.	11.20	12.06	12.89
9. Reinforcing steel	810,000 lb.	.045	.045	.046
10. Control houses	2 ea.	900.00	596.00	1,050.00
11. Sector gates, embedded, attached items	L. S.	37,800.00	38,400.00	28,020.00
12. Miscellaneous metalwork	28,150 lb.	.08	.13	.26
13. Riprap	1,720 c. y.	8.00	10.96	8.40
14. Handrail (excl. sector gates)	222 l. f.	5.00	5.40	5.67
15. Ladders (struc. walls only)	180 l. f.	5.00	4.88	5.00
16. Operating machinery	L. S.	9,500.00	7,430.00	7,560.00
17. Electrical work	L. S.	2,000.00	2,678.00	1,600.00

FLOOD PROTECTION
ELMIRA, N. Y.

OWNER: U. S. Engineer Office, Binghamton, N. Y.

PROJECT: Construction of flood protection project (Section No. 1) along right bank of Chemung River, within city limits of Elmira, Chemung County, N. Y. Involves construction of levee embankments, construction of new concrete walls, raising of existing walls, and construction and alterations of sewers, culverts, drains and manholes.

CONDITIONS: Contractor to furnish all materials and complete work in 550 days. Railway and highway transportation facilities available. Minimum wage rates specified are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 55 to 90c.; and common labor, 50c.

BIDS: Five bids were opened April 29, 1941, ranging from the contract low of $232,669 to $432,691. Engineer's estimate, $232,331.

LIST OF BIDDERS:

1. Binghamton Constr. Co., Binghamton, N. Y. (contract) $232,669
2. Kuchar Brothers, Montvale, N. J. 256,956
3. Clevorock, Inc., New York, N. Y. 323,959
4. L. B. Strandberg & Son, Chicago, Ill. 350,004
5. Spencer & Ross, Inc., Detroit, Mich. 432,691

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	L. S.	$6,500.00	$3,000.00	$12,000.00
2. Stripping, levee foundation	2,500 c. y.	.24	.40	.40
3. Excavation, common	18,000 c. y.	.50	.60	1.00
4. Excavation, borrow area	39,000 c. y.	.30	.40	.40
5. Excavation, rock	50 c. y.	4.00	6.00	5.00
6. Remove walls, slabs, paving, bldg. found. (conc. or masonry)	110 c. y.	2.50	8.00	15.00
7. Sheeting (incl. shoring)	9,200 s. f.	.05	.70	.40
8. Struct. backfill, compacted	5,200 c. y.	1.30	.50	1.00
9. Struct. backfill, uncompacted	700 c. y.	.15	.35	.70
10. Embankment, levee	36,000 c. y.	.12	.20	.30
11. Additional rolling	1,500 sq.	.03	.03	.05
12. Topsoil, placing	2,500 c. y.	.50	.70	1.00
13. Topsoil, furnish and place	300 c. y.	1.10	1.50	1.20
14. Seeding	4.4 ac.	172.00	250.00	250.00
15. Landscape grading	200 sq.	.55	.30	2.00
16. Dumped riprap	2,350 c. y.	4.50	7.00	9.00
17. Rock paving	70 c. y.	8.00	9.00	12.00
18. Gravel, backing and drains	500 c. y.	2.25	3.00	4.00
19. Test and seal exist. conc. surf	5,100 s. f.	.07	.20	.20
20. Class A concrete	3,700 c. y.	23.00	26.00	35.00
21. Class B concrete	100 c. y.	13.00	20.00	33.00
22. Drill holes, conc. or masonry	1,500 l. f.	.40	.70	.75
23. Steel sheet piling, type I	12,500 s. f.	1.20	1.20	1.25
24. Steel sheet piling, type II	23,800 s. f.	1.30	1.35	1.50
25. Steel sheet piling, type III	425 s. f.	1.40	1.50	1.60
26. Steel sheet piling, type IV	6,800 s. f.	.80	1.20	1.25
27. Cutting steel sheet piling or struct. steel	100 l. f.	.50	1.00	1.00
28. Burning holes in st. sheet piling	2,300 ea.	.20	.25	.20
29. Structural steel	47,000 lb.	.15	.06	.08
30. Miscellaneous metalwork	3,500 lb.	.15	.15	.20
31. Copper	1,700 lb.	.60	.50	.70
32. Steel for conc. reinforcing	352,000 lb.	.06	.05	.07
33. Replacing stone masonry	15 c. y.	6.00	15.00	30.00
34. 8-in. drain tile	510 l. f.	.50	.50	.50
35. Cast iron pipe	4,600 lb.	.05	.05	.08
36. 18-in. corr. metal pipe	41 l. f.	5.00	4.00	6.00
37. 8-in. plain concrete pipe	10 l. f.	.60	.50	.75
38. 12-in. plain concrete pipe	10 l. f.	.75	1.00	1.35
39. 15-in. plain concrete pipe	20 l. f.	1.10	2.00	1.80
40. 18-in. plain concrete pipe	50 l. f.	1.50	2.50	2.50
41. 30-in. rein. concrete pipe	85 l. f.	6.00	5.00	6.00
42. 30-in. rein. conc. pipe, ext. str.	55 l. f.	6.00	6.00	7.50
43. 8-in. drainage gates	4 ea.	30.00	28.00	30.00
44. 12-in. drainage gates	2 ea.	35.00	30.00	40.00
45. 15-in. drainage gates	1 ea.	45.00	45.00	45.00
46. 18-in. drainage gates	1 ea.	60.00	60.00	70.00
47. 30-in. drainage gates	1 ea.	110.00	100.00	140.00
48. Recondition and reinstall 15-in. gates	1 ea.	30.00	30.00	40.00
49. Wood stop logs	.75 M bm.	100.00	150.00	300.00
50. Temp. road surf., gravel	170 c. y.	4.00	3.00	6.00

REVETMENT, NEBRASKA

OWNER: U. S. Engineer Office, Omaha, Neb.

PROJECT: Construction of approximately 8,000-feet of revetment along Missouri River between Sioux City and Winnebago Bends, seven miles from Homer, Neb.

CONDITIONS: Government to furnish piling and lumber, contractor to furnish all other materials. Alternate methods of bidding were allowed, the contractor to furnish all materials (Method A), or the government to furnish the piling and lumber, and the contractor to furnish all other materials (Method B). All bids received were on the latter basis as the contractors were not sure of obtaining materials due to the needs of the defense program. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.12½c per hr.; semi-skilled, 85c.; and common, 50 to 65c.

BIDS: Three bids were received September 18, 1941, ranging from the low of $183,069 to $202,931. It is estimated that the materials to be furnished by the government will cost $22,023, thus making the total cost $205,092. This compares with the government estimate of $199,237.

LIST OF BIDDERS:

1. Woods Bros. Constr. Co., Omaha, Neb. (low) $183,069
2. Massman Constr. Co., Kansas City, Mo. 192,664
3. James Constr. Co., St. Paul, Minn. 202,931

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Furn., construct, place willow mattress	850 sq.	$7.50	$9.20	$10.00
2. Const. and place lumber mattress	1,010 sq.	4.25	3.80	5.25
3. Furn., const. and place comb. mattress — willow mattress	2,665 sq.	8.00	9.50	10.50
4. Const. and place combination mattress — lumber mattress	2,665 sq.	4.75	4.10	5.40
5. Furn. and place stone on mattress	13,050 ton	3.95	4.10	4.25
6. Furn. and place stone in cast paving	8,125 ton	4.25	4.60	4.65
7. Furn. and place stone in hand-placed paving	5,560 ton	5.30	5.80	5.25
8. Furn. and place cr. stone or quarry chips	500 ton	4.25	4.50	4.25
9. Placing piles	20,285 l. f.	.23	.20	.25
10. Furn. and place suspension cables	26,040 l. f.	.04	.055	.06
11. Grading	103,750 c. y.	.145	.15	.15

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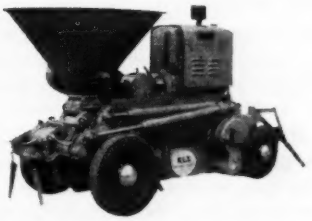

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REX **PUMPCRETE**

THE PUMP THAT PUMPS CONCRETE

CHAIN BELT COMPANY OF MILWAUKEE

FLOOD WALL, OHIO

OWNER: U. S. Engineer Office, Pittsburgh, Pa.

PROJECT: Construction of flood wall and appurtenant works for Part 2 of Wellsville Flood Control Project, Wellsville, Columbiana County, Ohio, involving the following major features: concrete wall; dike; pump house; diversion drain.

CONDITIONS: Contractor to furnish all materials and complete work in 270 calendar days. Highway and railroad transportation facilities available. Work is adjacent to main tracks of Pennsylvania Railroad, and care must be taken that traffic over tracks is not interrupted nor endangered. Wage rates prevailing in vicinity of work considered minimums.

BIDS: Three bids were opened April 28, 1941, ranging from $90,503 to $122,423. Engineer's estimate $123,346.

LIST OF BIDDERS:

1. Sanctis Construction, Inc., Pittsburgh, Pa. (contract) $90,503
2. Galier Bros., Cleveland, Ohio 110,618
3. Bert A. Jacobsen, Pittsburgh, Pa. 122,423

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	L. S.	$1,000.00	$1,500.00	$1,000.00
2. Remove existing structures	L. S.	500.00	200.00	1,000.00
3. Common excavation	2,300 c. y.	.50	1.00	1.50
4. Excav. in borrow area, incl. haul	27,100 c. y.	.55	1.00	.60
5. Special excavation	5,800 c. y.	1.20	1.25	2.25
6. Compacted fill	5,400 c. y.	.70	.75	1.00
7. Uncompacted fill	350 c. y.	.40	.25	.10
8. Impervious fill in dike	25,000 c. y.	.35	.20	.55
9. Gravel fill	1,500 c. y.	2.10	2.25	3.00
10. Conc. for misc. structures	245 c. y.	20.00	17.00	25.00
11. Concrete in pumping station	405 c. y.	20.00	30.00	18.00
12. Furn., place reinforcing steel	60,000 lb.	.07	.06	.00
13. Furnishing cement	900 bbl.	2.25	2.50	3.00
14. Copper water stops	150 lb.	.50	1.00	.80
15. 39-in. concrete pipe	1,880 l. f.	6.00	6.00	10.00
16. Cast iron pipe	7,300 lb.	.10	.05	.06
17. 6-in. drain tile	250 l. f.	.60	.25	.20
18. Construct manhole and track inlets	L. S.	700.00	2,000.00	1,139.00
19. Furn., install valves (complete)	L. S.	1,000.00	600.00	1,000.60
20. Remove and relay pavement	L. S.	1,500.00	3,300.00	800.08
21. Miscellaneous metal	3,950 lb.	.12	.15	.20
22. Relocate railroad track	L. S.	100.00	1,000.00	1,000.00
23. New cross-ties	90 ea.	.60	4.00	2.00
24. Pumping station	L. S.	15,000.00	18,000.00	20,00000

STEEL BULKHEAD NEW YORK

OWNER: City of New York, Department of Parks, New York, N. Y.; William H. Latham, park engineer.

PROJECT: Construction of steel bulkhead beginning at Fairlawn Avenue, concrete bridge, and other incidental work in Marine Park, Borough of Richmond, N. Y. (Contract No. R-16-241). Includes painting of existing bulkhead.

CONDITIONS: Contractor to furnish all materials and complete all work in 180 calendar days. Rail, highway and water transportation facilties available. Wage rates are: skilled labor, $1.40 to $2.25 per hr.; semi-skilled, 72c. to $1.65; and common, 87½c.

BIDS: Two bids were opened October 14, 1941, the low of $297,520, and $312,061. Engineer's estimate, $294,400.

LIST OF BIDDERS:

1. Charles F. Vachris, Inc., Brooklyn, N. Y. (low) $297,520
2. E. W. Foley, Inc., Brooklyn, N. Y. 312,061

Item	Quan.	Unit Prices (1)	(2)	(3)*
1. Unclassified excavation	3,700 c. y.	$0.30	$1.25	$1.00
2. Wet excavation	2,100 c. y.	.25	3.20	1.00
3. Borrowed fill	1,800 c. y.	.50	.00	1.00
4. Steel sheet piling	2,872,000 lb.	.055	.053	.055
5. Structural steel	213,000 lb.	.10	.18	.07
6. Tie bars and turnbuckles	110,000 lb.	.14	.17	.12
7. Misc. iron and steel	88,000 lb.	.15	.07	.12
8. Untreated timber piles	34,200 l. f.	.80	.86	1.00
9 Creosoted timber piles	2,800 l. f.	1.00	1.23	1.50
10 Untreated timber and lumber	123 Mbm.	150.00	200.00	140.00
11 Creosoted timber and lumber	41 Mbm.	200.00	180.00	175.00
12. Load test for piles	6 ea.	300.00	250.00	100.00
13. Concrete 1:1½:3	385 c. y.	10.00	17.00	15.00
14. Portland cement	770 bbl.	2.00	2.00	2.50
15. Steel bar reinforcement	38,000 lb.	.05	.07	.06
16. Dimension masonry	23 c. y.	125.00	150.00	150.00
17. Stone masonry	43 c. y.	50.00	82.00	100.00
18. Membrane waterproofing with protection course	350 s. y.	2.00	2.75	1.80
19. Painting existing bulkhead	50,000 s. f.	.35	.08	.25
20. Filling in back of bulkheads	18,000 c. y.	.25	.10	.28

* *Engineer's estimate.*

EARTHWORK AND STRUCTURES MONTANA

OWNER: Bureau of Reclamation, Fairfield, Mont.

PROJECT: Earthwork and structures for open drains, Greenfields division, Sun River project, Montana. Work located near Fairfield and Ashuelot, Mont. Much of work on structures to be carried on during period when irrigation water is being delivered to growing crops.

CONDITIONS: Government to furnish cement, reinforcing bars, corrugated metal pipe, lumber (excepting for forms), fencing material. Contractor to furnish balance of material and complete work in 350 calendar days. Rail and highway facilities available to Fairfield and Ashuelot. Minimum wage rates specified are: skilled labor, $1.00 to $1.20 per hr.; semi-skilled, 65 to 95c.; and common, 65c.

BIDS: Eleven bids were received November 7, 1941, ranging from the low of $44,880 to $97,475.

LIST OF BIDDERS:

1. Williams Constr. Co., Helena, Mont. $44,880
2. Ray Schweitzer, Los Angeles, Calif. 48,318
3. Elmer Genger, Fairfield, Mont. 54,535
4. J. L. McLaughlin, Great Falls, Mont. 54,590
5. Barnard Curtiss Co., Minneapolis, Minn. 58,833
6. Union Constr. Co., Great Falls, Mont. 58,835
7. Vernon Bros. Co., Boise, Idaho 67,375
8. Hugh McConnell, Missoula, Mont. 72,943
9. E. O. Howe, Great Falls, Mont. 76,110
10. J. W. Merz, Inc., Helena, Mont. 84,375
11. Peter Kiewit Sons' Co., Omaha, Neb. 97,475

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation for drains	525,000 c. y.	$0.07	$0.08	$0.075
2. Excavation for structures	18,000 c. y.	.10	.001	.30
3. Backfill about structures	25,000 c. y.	.10	.10	.20
4. Puddle bkfill. about struct	1,850 c. y.	.20	.20	.20
5. Concrete in structures	130 c. y.	15.00	18.00	18.00
6. Place reinforcing bars	8,000 lb.	.02	.02	.025
7. Laying 15-in. corr. pipe	1,200 l. f.	.20	.15	.30
8. Laying 24-in. corr. pipe	3,600 l. f.	.30	.20	.40
9. Move excavating machine	2 mi.	15.00	15.00	25.00

RESERVOIR, TENNESSEE

OWNER: U. S. Engineer Office, Memphis, Tenn.

PROJECT: Construction of Nonconnah Pumping Station Reservoir and placing of two portions of levee embankment to close two gaps in Nonconnah Levee, and appurtenant work for Section 8, a part of the Memphis, Wolf River and Nonconnah Creek Project. Located on right bank of Nonconnah Creek, Shelby County, Tennessee.

CONDITIONS: Contractor to furnish all materials and complete work without interference to other government work in same area. Wage rates are: skilled labor, $1.12½ to $1.50 per hr.; semi-skilled, 60 to 85c; and common, 35c.

BIDS: Four bids were opened June 26, 1941, ranging from the low of $87,954 to $135,650. Engineer's estimate $104,248.

LIST OF BIDDERS:

1. West Memphis Constr. Co., West Memphis, Ark. $ 87,954
2. C. J. List Constr. Co., Kansas City, Mo. 118,328
3. Wm. Crumpecker & Son, Morehouse, Mo. 120,864
4. Ziegler Constr. Co., Nashville, Tenn. 135,650

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	293,500 c. y.	$0.188	$0.285	$0.26
2. Levee embankment	43,000 c. y.	.188	.20	.26
3. Ditch paving	9,800 s. y.	2.50	2.25	3.55
4 Levee roadway	320 a. y.	.60	.50	1.70

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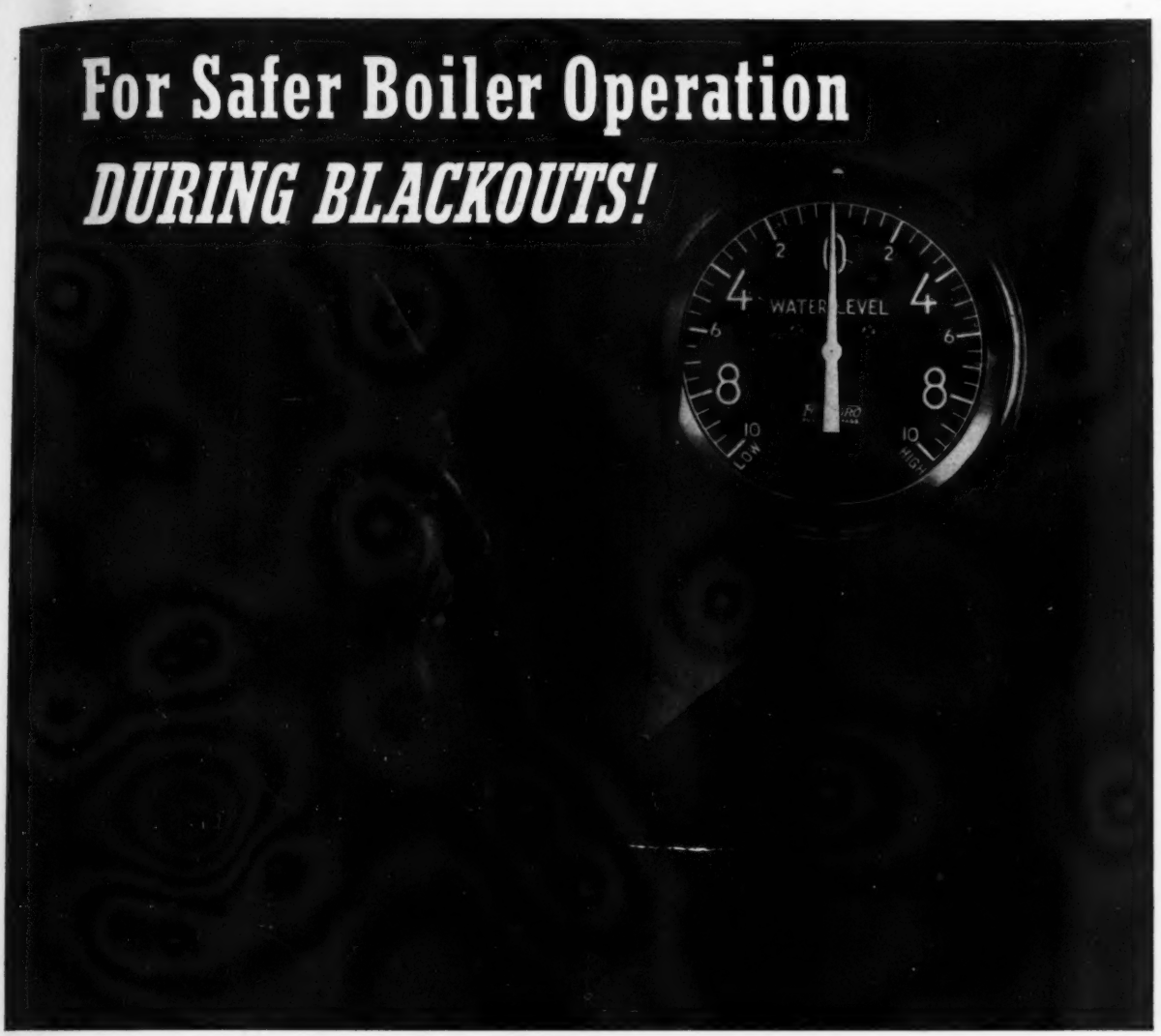

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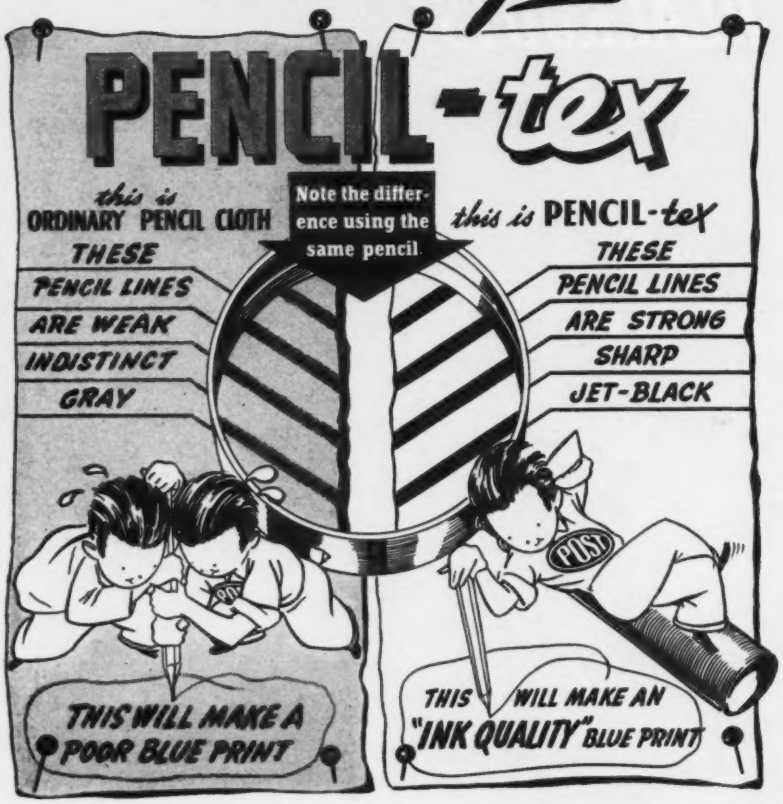
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